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THE SALT INDUSTRY IN INDIA

By

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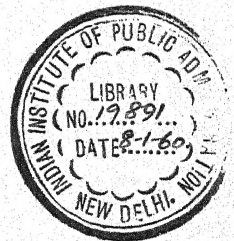
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FOREWORD TO THE ORIGINAL EDITION

Lala Shugan Chand Aggarwal, who has compiled this book on Salt, has asked me to write a Foreword. Lala Shugan Chand Aggarwal is a Superintendent of the Northern India Salt Revenue Department, which he entered over ten years ago after a brilliant University career. He has worked as a mining engineer in the Salt Range mines for some years. He has also been in charge of the manufacture of brine salt by the evaporation process. He has, thus, acquired a good deal of practical experience of the subject on which he writes. He has added to this practical experience great industry and thoroughness in collecting facts relating to the salt industry in every part of India. The result is a book full of interest and information, which cannot fail to be useful to those engaged in the Salt industry, whether as private manufacturers or servants of Government in the various Salt Departments. His book should also prove attractive to students and public men who desire full and accurate information on the subject of Salt which is of perennial interest not only as a condiment but also as a great national industry and a source of considerable revenue to Government.

2. This book has been prepared under the authority and with the general approval of the Government of India; but it must not be understood that the approval of the Government of India extends to every statement of fact or each particular expression of opinion.

F. C. KING,
Commissioner, Northern India
Salt Revenue.

DELHI,
The 25th March 1936.

PREFACE TO THE ORIGINAL EDITION

The salt industry in India is one of the most pressing problems of the day. Although the industry is one of the oldest in this country, it has received very scanty attention at the hands of authors. There are numerous pamphlets, reports and brochures on salt which give the reader some information on a particular aspect of the salt industry, but there is no single book to my knowledge, which deals with the various aspects of the industry in general and with special reference to India in particular in a comprehensive form. In the present work, I have attempted to place in the hands of the reader fairly exhaustive and up-to-date information on salt in the form of a handy volume.

The book first deals with the various aspects of the salt industry in general. It next deals with the various Indian salt sources and shows how the present-day scientific methods have gradually replaced the pre-British crude systems of salt mining and manufacture. An effort has been made to maintain a keen historical interest throughout the book. During recent years the salt industry has made rapid strides; so a chapter has been devoted to the recent developments and future prospects of the Industry, besides general chapters on "Saltpetre and Allied Industries", "History of Salt Revenue", "Industrial and Agricultural Salt", "Consumption and Prices" and "Treaties", etc. Moreover, the book has been written in a style which will make it interesting even to lay-men who may be anxious to know something about this necessity of life. It is hoped that the book will be found particularly useful by persons connected with salt, the members of the Indian Legislatures, the salt traders and business men, and students of economics.

I have freely availed myself of the printed sources of information on the subject of salt. A list of the "Authorities consulted" is given at the end.

I am very grateful to Mr. F. C. King, I.C.S., Commissioner, Northern India Salt Revenue for his constant support, sympathetic advice and criticisms which in a work of this kind were most invaluable. He encouraged me a good deal and made valuable suggestions from time to time which helped me a lot. He also scrutinized the portion of the book relating to Northern India. He also very kindly permitted me to use his office library

books and other Government publications. He also kindly forwarded the book to Government and recommended its adoption as an official publication. My personal obligations to him for all these things and for writing a Foreword cannot be adequately expressed.

The Government of India were pleased to accept the Commissioner's recommendations that the book should be adopted as an official publication and should replace the present publication, "The Systems and Practice of Salt Administration in India". They also sent me redrafts of the portions relating to Madras, Bombay, Sind, Burma, etc., proposed by the Heads of the Departments concerned for inclusion in the revised edition of the "Systems and Practice of Salt Administration in India" and ordered me to bring my book up-to-date in the light of these redrafts. I have accordingly gone over the whole work again and brought it up-to-date. Needless to say that the redrafts have been of immense help to me.

My thanks are also due to Mr. F. H. Byron, Collector of Salt Revenue, Burma, who kindly sent me books about the Burma Salt Department and corrected the chapter on Burma. Some officers of other Salt Departments helped me with books and also went over certain portions of the book, but they have not permitted me to publish their names. My silent thanks are due to them. I also place on record my deep sense of obligation to L. Shiv Charan Das, Administrative Officer, Salt Range Division, Khewra, who willingly devoted considerable time and assisted me in the preparation of the book. L. Sheo Prasad Srivastava, B.A., and my brother L. Ghansham Das, B.Sc., B.T., P.E.S., Lecturer, Central Training College, Lahore, also deserve my thanks for their help.

SHUGAN CHAND AGGARWAL.

KHEWRA,

The 25th July 1936.

PREFACE TO THE REVISED EDITION

The first edition was published in 1937. Since then the Salt Industry in India has undergone revolutionary changes, such as, abolition of Salt Duty; shifting of important sources of Salt Range, Kohat mines and Sind to Pakistan resulting in deficit necessitating imports; special efforts to increase the production and to make the country self-supporting in salt, problems of short supply and high prices following the Partition, Development of many new sources, separation of Central Excise and creation of an All-India Salt Department by amalgamation of Salt portions of Bombay, Madras and Northern India Central Excise Departments, introduction of the Zonal Scheme, shift of the salt policy from revenue collecting angle to development side and banning of imports and starting exports after a hundred years. These 20 years have seen all these changes and it was felt that the book should be brought up-to-date. When the book was originally published, the Government of India decided that it should be revised every five years. The Central Board of Revenue wanted me to revise the book in 1942 and again in about 1946 but unfortunately I was very busy in the Supply Department and could not attend to the work except off and on. I, however, continued to collect the material and put it in shape all these years. Efforts were also made to collect facts and figures about salt industry in various European countries, Canada, America, etc. From the original edition some chapters, such as, "Salt and Struggle for Freedom" (Civil Disobedience Movement) were deleted by the Government of India at that time. Things have now changed and the chapters, which were perhaps deleted for political reasons, have now been included. The special features of the revised edition are:—

Details of Administrative changes, views of various Committees on salt industry during the last 20 years, Government stress on improvement of quality of salt, history of abolition of Salt Duty, implementation of the Salt Experts Committee's recommendations, details of the steps taken to make up the deficiency in salt caused by the loss of important salt sources as a result of the partition, addition of Zonal Scheme for distribution of salt, addition of chapters on Prices, By-products, Technology, Analysis, etc., addition of chapter on salt industry in various States in India and in foreign countries. In addition to these, several photographs depicting various aspects of salt manufacture

and distribution throughout the country and various graphs, sketches, maps etc. have been added in this edition.

The background, historical, technical, and general, as given in the original book remains practically the same.

I am grateful to several of the Salt Department Officers, particularly Sarvashri H. J. Everden, N. G. Mitra, K. L. Gambhir, M. K. Chatterjee, Sheo Prasad and S. K. Das Gupta, who have assisted me in preparing the portions relating to their spheres. I am also highly obliged to Shri Satya Pal Singh, my Stenographer, who has taken a lot of pains and has been helping me for the last several years in putting the material in shape. He also took great pains in going over the proofs. My thanks are also due to Shri V. P. Chopra and Shri Prem Chand Jain, especially the latter on whom the brunt of typing work has fallen and who has been working very willingly indeed.

While most of the information in the book is historical or factual and the data has been collected from old records, histories, brochures, Administration Reports and technical books etc., any views contained in the book are my own as an individual observer and I am responsible for the contents and the views expressed in the book and these should not be treated as those of Government.

I trust the second edition will be found useful by the public, officers of the Salt Department, economists, parliamentarians and all connected with salt and will get appreciation from them just as the first edition, which was exhausted in about three-four years only.

S. C. AGGARWAL.

NEW DELHI,

ERRATA

Page	Para or line	For	Read
ix	Below '(3) Foreign and Imported salt'	—	Preventive measures
47	Under 'H—Selling Prices'	after 'The'	wholesale
	1st line	fluctuated	fluctuate
	last line	2251-	225/-
48	Line 14 from bottom	after 'Taking'	all these
		boua	bona
	Line 10 from bottom	Controllers	Controller
61	Line 8 from bottom	-4/9/-	-4/9
62	Para 2	anna -4/-	annas four
83	Under Bombay against 1955-56	45·46	45·49
87	Para D.-Labour, line (3)	<i>dalas</i>	<i>dalals</i>
107	Line 16	fixed was	was fixed
110	Line 2	Fatories	Factories
111	In the cost of production	Cost of filing & weighing	Cost of filling & weighing
		Handling charges	Handling charges
		case	cess
151	Line 3 from bottom	and regulations	and regulations
154	Para 2, last but one line	distribute	distributed
189	Last line	despatche	despatch
190	Para 1, line 8	tract	track
	Line 14	at most	almost
214	Line 7	depend	depends
215	Column under Production	Quantity of salt purchased	Quantity of salt produced
230	2nd foot note	Includes	Includes
259	Para (7), last two lines	cus oms	customs
269	Para (iii), line 9	after 'all round'	them
	Line 14	buring	during
286	Para 2, line 5	meteological	meteorological
416	Heading under para 1	AND	May be deleted
420	Line 5	Mareas	Madras
457	Para (b), Line 9	sale	scale
536	Line 2 from bottom	exceeded	exceeding
594	Para 2, line 3	cut	out
	Line 2 from bottom	evaportion	evaporation
630	Table IX, Against 15 under 'Weight in 100 parts water'	(18°)	23·04
	under column 'Weight of water to dissolve 1 part salt'	—	4·340

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SHOWING
SALT PRODUCING CENTRES

ROCK SALT SOURCE	{ Govt	□
	{ Privt	
INLAND SALT — do —	{ Govt	△
	{ Privt	▲
SEA SALT — do —	{ Govt	◎
	{ Privt	○



CHAPTER I

HISTORICAL ASPECT OF SALT IN THE WORLD

Salt is existent in all animal and vegetable life and is coeval with life itself. It must have been present in the first herbage that gave nourishment to the first beast. The history of salt is thus the history of civilization on earth. In the beginning, man must have absorbed sodium chloride from the uncooked flesh of animals, birds and fish. Herbivorous animals found little salt in grasses and instinct directed them to sea swamp pasturage and to outcropping deposits of salt. A deficiency of salt must have occurred and been felt by man, when he first began to use fire and boil food, since in boiling a certain percentage of salt is removed by water. His herds then must have directed his attention to "salt licks" from which they satisfied their saline wants and so enabled him to secure salt at a distinct condiment. Man in the beginning must have got his salt supply from brine springs, sea and outcrops of salt. There is no record to show when salt was first employed in cooking, but the use of salt as a condiment certainly shows a great advance in civilization.

From evidence discovered in dwellings of cavemen in Belgium it is supposed that salt was used in cooking of wheat 5,000 years ago. Old Mosaic, Chinese, and Sanskrit records also refer to salt. The Sanskrit word for salt is 'lavana' to which 'Nun', the common Punjabi word for salt, owes its origin. Susruta, the father of Indian medicine, speaks of four kinds of salts which correspond with rock salt, sea salt, lake salt and earth salt respectively. We read of salt in the Iliad of Homer (850 B.C.). Salt was known to the sagacious Hebrew, the aesthetic Greek and the imaginative Asiatic. The Greek and Roman writers refer to licking of salt; the natives of Abyssinia lick it even now. It is not definitely known as to when salt became an article of commerce, but it is certain that salt trade was the earliest form of commercial enterprise. According to Herodotus (484 B.C.), the Egyptians salted ducks, quails and sardines; they also preserved the bodies of their illustrious dead (Egyptian mummies) in salt. Caravans used to bring salt from North Africa across the Sahara. The Egyptians produced rock salt from the salt basins of the Sahara. Egypt doubtless exerted a great influence over the civilized parts of Europe. It is surmised that through her instrumentality the use of salt was made known to the surrounding nations and tribes. The Babylonians also knew the use of salt.

The first mention of salt in the Chinese language is found in the annals of Emperor Yu (2205-2197 B.C.). Even now salt is produced in China by solar evaporation. In Japan the manufacture of salt by boiling etc., was introduced some 2,000 years ago.

We do not know the period when salt came to be regarded as a symbol of sanctity. In the times of Pythagoras, 600 B.C., salt was regarded an emblem of justice. Biblical records repeatedly refer to salt, where it is mentioned as an emblem of fidelity and wisdom. Perhaps a high estimate of its hygienic value may have had something to do with the semi-sacred position occupied by it. Interest in salt is by no means of recent origin. The age-old adage 'worthy of his salt' or 'True to his salt' proves the importance attached to this commodity from times immemorial. In India even now many customs prevail which show the sanctity of salt. When two parties or persons have a mutual agreement or pact, they throw a pinch of salt

in a pot of water and swear to stick to their promise saying that if they break their word, they may perish and vanish as salt dissolves in water and vanishes. People in the Punjab are against throwing away salt and have a superstition that if they throw away or waste salt by mixing it in dirt, they will have to lift it with their eyelids in the next world. These superstitions show the esteem in which salt has been held in India from times immemorial. Undoubtedly similar is the case in almost all countries, where mystic conceptions of salt still prevail.

Salt has thus had a potent influence on ancient literature, superstitions, and the nomenclature of places. Many old towns in Germany, as "Hallein" in Salzburg, derive their names from "Halle", salt. A large number of English towns whose names terminate in 'wich' owe their origin as well as their names to salt, for example Northwich, Nantwich, Droitwich. "Wich" meant a dwelling place, but was identified with salt industry and this termination was adopted as indicating a salt manufactory. In England the earliest description of salt occurs in Georgius Agricola's work "De Re Metallica" published in 1556 A. D. This book remained the standard text-book on Mining and Metallurgy for nearly the following two centuries. Extensive conservatism has been prevalent in the methods of salt manufacture. The method of preparing salt by heating brine persisted for a long time, till William Furnival introduced steam heat in 1823. He was the precursor of the great improvements afterwards achieved by the Vacuum process of Boiling.

The great salt mines of Wieliczka in Poland in the lower Carpathians have been worked since the 13th century. These mines with their underground houses, monuments, chambers, ball rooms and restaurants, lakes, bridges and railway stations constitute a city that reminds one of the art and industry of by-gone periods. The Rumanian salt mines of Tirgu-Ocna and Ocnele-Mari have also been worked for centuries. In America salt springs were discovered about the middle of the 17th century in New York, but manufacture of salt on a commercial scale was not begun till 1788, when the industry was established in the vicinity of Syracuse. Solar salt is still manufactured there on a vast scale. Salt manufacture has been going on in Italy, France and Portugal for centuries. The Italians were the pioneers who developed salt works in Aden as well.

In India manufacture of salt along the sea coast in Bengal, Bombay, Madras and the Rann of Kutch, flourished as a cottage industry for centuries. In his "Early History of Bengal" Mr. F. H. Manahan gives a passage from 'Arthashastra'—a book dealing with the history of the Mauryan period (300 B.C.)—which says that salt manufacture was even at that distant date supervised by a State official named 'Lavanadhyaksa' and the business was carried on under a system of licences granted on the payment of fixed fees or part of the output. The tradition handed down from Hindu Kings of old is even now followed by the Government of India, who not only supervise the manufacture of salt, but are themselves the most important manufacturers. In the Punjab (the portion now in Pakistan) rock salt has been known for a long time. Alexander, the Great, noticed that Indian mountains contained rock salt. In some of these mountains abandoned rock salt mines of an ancient date still exist. In olden days, people in the Uttar Pradesh used to get their supply of salt by lixiviating salt earth which practice still prevails in some parts. Salt works existed in almost all the parts of Rajasthan. It was, however, with the advent of the British that regular and systematic mining or manufacture of salt on a commercial scale began. India now produces about 3 million tons or about 800 lakh

maunds of salt per annum; the Salt works in Bombay, Madras, Rajasthan (namely, Sambhar, Pachbadra and Didwana), Saurashtra, Kutch, Travancore, Orissa, West Bengal and the rock salt mines at Mandi in Himachal Pradesh make up this quantity. Since the Independence in 1947, steps have been taken not only to meet the country's requirements of about 2.4 million tons or 650 lakh maunds per annum, but also to produce enough salt to admit of exports.

The total world production of salt is 40-42 million tons; India's production thus is about 7 per cent of the world production. With the development of the chemical industry and further growth of population etc., India's production is likely to rise to 4 million tons.

CHAPTER II

COMMON SALT—PROPERTIES AND USES

(a) PROPERTIES

Salt was the name originally given to the residue left by evaporation of sea water. Afterwards the name was employed to include all substances held in solution in sea water. Chemists ultimately extended the name to cover all combinations of an acid and a base. Sodium chloride (NaCl), now called common salt, is an example of the simplest type of chemical salt. A molecule of common salt contains an atom of chlorine combined with 23 parts by weight of sodium to form 58.5 parts of common salt. Rock salt is rarely found in an absolutely pure anhydrous state in which it is colourless and perfectly transparent. In most rock-salt mines such specimens are considered curiosities. In Wieliczka mine in Poland and in Khewra mine in the Punjab large masses of salt containing over 99 per cent NaCl are met with. In the Punjab mines we meet with salt of different colours such as white, pink, darkish or red. The colour disappears when salt is crushed to powder. The colour of sea water is affected by the percentage of salt in it; as the quantity of salt decreases, the colour changes from blue to green. Salt is met with in any colours; white, pink, red, brown, greenish and grey. The red or green colour is attributed to the presence of infusoria.

Salt is highly soluble in water, 100 parts of which dissolve 37 parts of salt. The specific gravity of such solution is 1.2; the specific gravity of salt crystals is 2.16. The smallest quantity perceptible to taste is 68 grains of salt dissolved in a gallon of water.

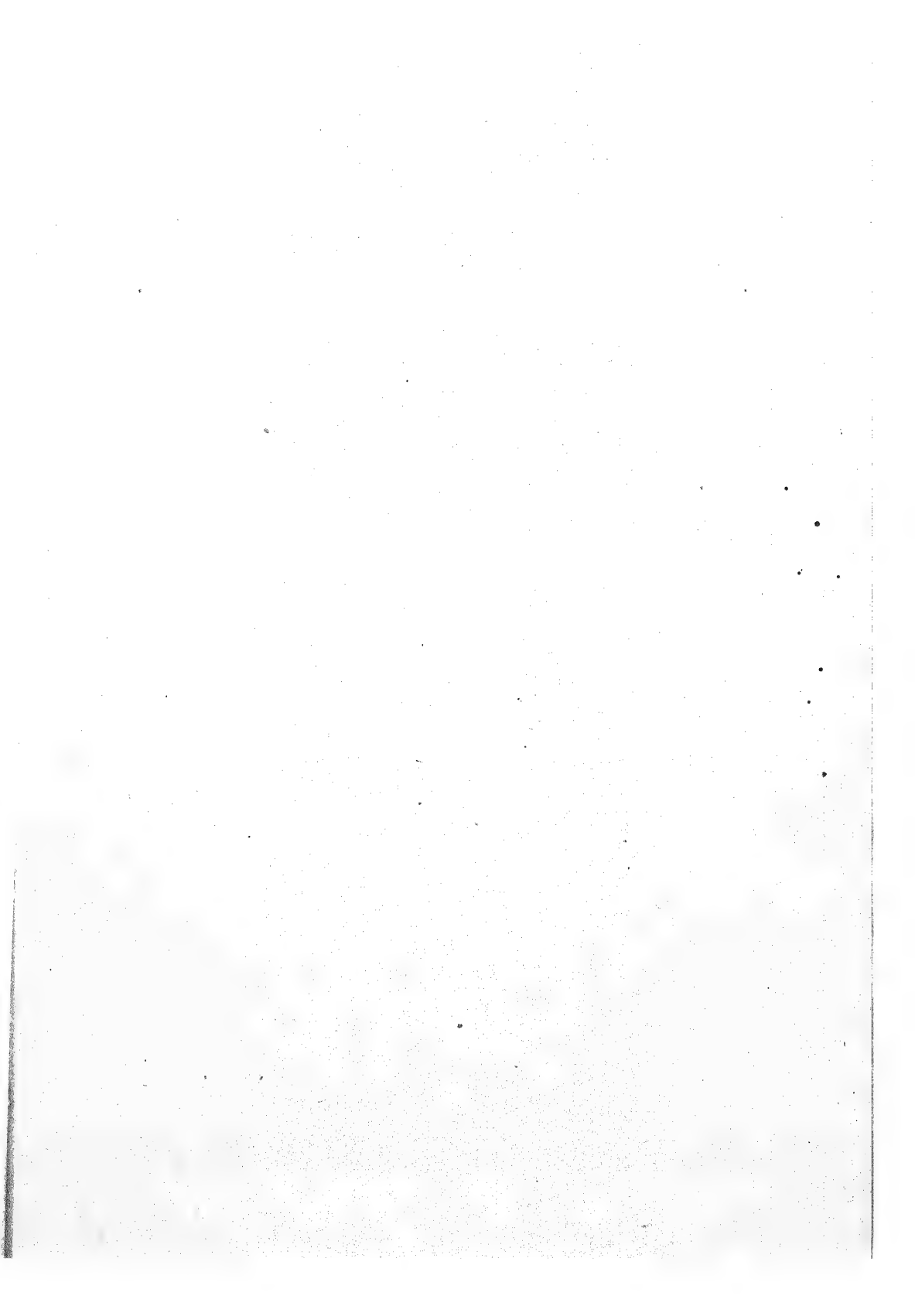
Pure sodium chloride is not deliquescent. It, however, absorbs moisture owing to the presence of magnesium chloride.

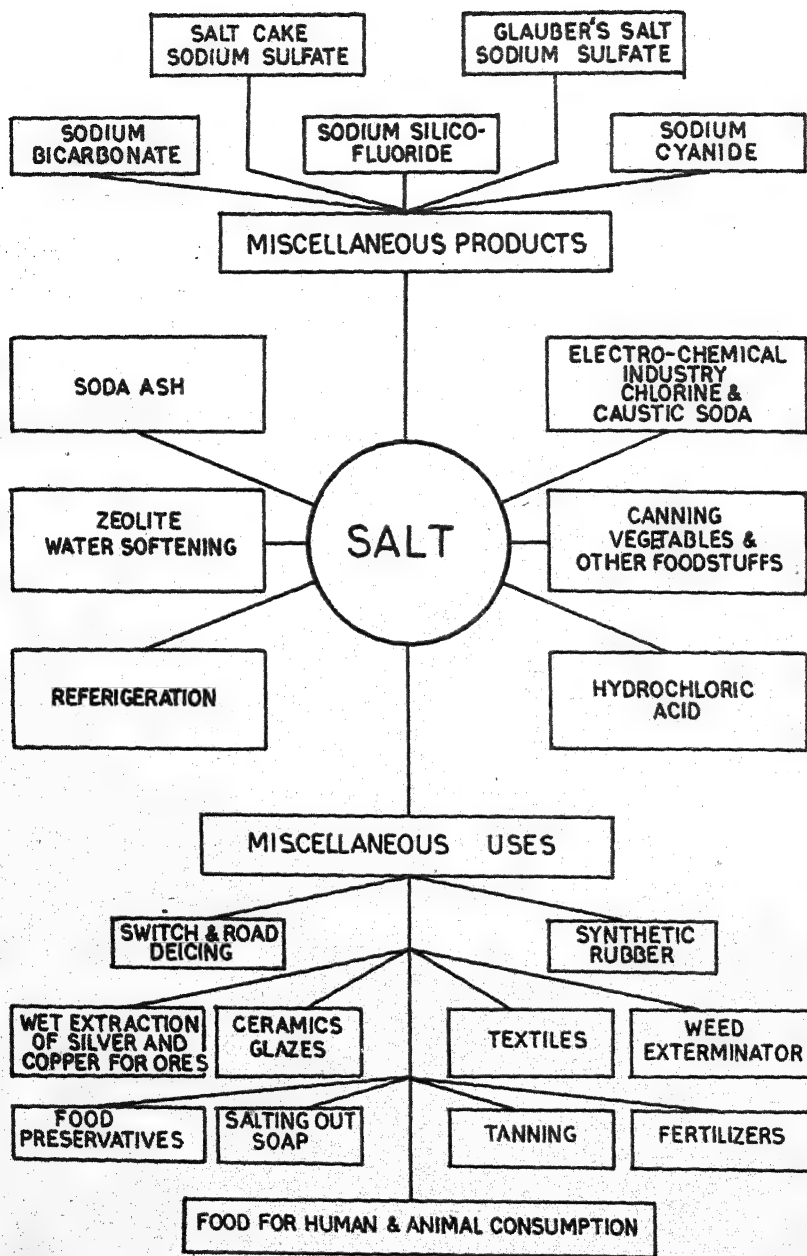
Sodium chloride melts at very high temperatures; at still higher temperatures it evaporates and at white heat it volatilizes forming thick clouds. It does not diffuse much, even when masses of varying densities are superimposed on one another.

Salt is fairly hard. There is no standard unit fixed for hardness. Geologists, however, compare the hardness of minerals by a comparative table (Moh's table of hardness), according to which the hardness of talc is considered as one and that of diamond ten. According to this standard the hardness of salt is 2.5. Its cohesion or power of supporting pressure is twice as great as that of bricks.

Common salt is a crystalline substance; crystals generally form cubes and sometimes they form octahedrons. The form of crystals depends on temperature, state of rest or motion, length of time, etc. Salt has a perfect cleavage. It splits up readily into planes parallel to the faces of the cubes of which it is composed.

Salt has acoustic properties as well—that is to say, it is a good medium for the transmission of sound. Workmen in a salt mine are able to signal by blows on the face of the rock. Salt possesses in a high degree the power of staying decomposition in dead organisms and is the commonest of all preservatives. Owing to this property it is an absolute necessity to the life of man and the higher animals.





M O R E I M P O R T A N T U S E S F O R S A L T

Salt water trickling through the roof of a working also forms stalactites and stalagmites just as lime-stone forms them. In Khewra mine we meet with long hollow tubes of salt formed by the brine trickling drop by drop through the roof.

Rock salt has many minerals associated with it; for instance, gypsum, sodium sulphate, magnesium sulphate and magnesium chloride. In the Khewra mine, salt is found mixed with variously coloured clays, white, pink, red, variegated gypsum beds, lime-stone, magnesium sulphate. Bad salt is associated with magnesium sulphate and good salt with calcium chloride. A cubic foot of pure rock salt weighs about 130 pounds or about $1\frac{1}{2}$ maunds.

(b) Uses

It would mean a small book by itself, if the uses of salt were to be given in detail; so they are given in an outline only.

Common salt is a necessity of life. It imparts an agreeable flavour and improves the taste of food, and is used as a condiment. It may be interesting to know how exactly salt consumed in its natural or artificial form functions in the human body. It promotes digestion, since when absorbed it is turned into hydrochloric acid—an essential constituent of gastric juice. It also acts as a stimulant to nerves and causes increased flow of saliva. It is present in blood and muscles. It is antiseptic, prevents putrefaction and promotes cell formation of the body. Too much deficiency of salt in the human body would give rise to worms in the stomach. It controls the density of the blood, maintaining it in a condition conducive to health. A diminution of salt in the blood results in disease; the blood loses its richness and is deprived of its vitalizing property. Salt is used as a vehicle for making up deficiency of certain ingredients in human metabolism, e.g. it is iodised by infusion of minute doses of potassium iodide about 0.02% as prophylaxis for goitre. Similarly, it is medicated with phosphates or other ingredients to regulate the deficiencies in human system. Salt, in short, is a preserver of health.

Salt is no less essential for cattle and sheep. Where cattle live mostly on grasses which are deficient in salt, they travel long distances in search of it. In fact, amongst cattle salt hunger obtains in such an intense form that cattle are often induced to lick human or animal excreta. A liberal use of salt for cattle saves them from disease and improves their constitution. For sheep farming too salt has an inestimable value when mixed with food. It contributes to the betterment of wool. Want of sufficient salt causes various diseases amongst the livestock. Lord Lawrence, in his evidence before the Select Committee on East India Finance in 1873, attributed the prevalence of murrain in the Indian cattle to the want of salt in their food.

Salt is also very valuable for agriculture. Its use as an agricultural manure has been recognized for ages past. It was used as a chemical manure long before the Christian era, and its value was recognized throughout Europe. The ancient Hebrews applied it as a manure over 2,000 years ago in Palestine, and so did that eminently agricultural people the Chinese and do still to this day. The old Romans too used it as manure. In India its use in agriculture is rather looked on with disfavour. Just as salt stimulates digestion so it causes increased nutritive activity in the tissue of plants and has healthy stimulating effect on them, renewing their health.

and vigour. It dissolves certain salts, for instance, earthy phosphates and thus assists in their assimilation by plants. It also assists in dissolving silica and the oxidation and solution of iron. It attracts moisture to the soil and so helps vegetation. Salt also undergoes chemical changes in the soil which may result in the formation of fertilizers such as sodium carbonate, sodium phosphate, etc., and is a valuable fertilizer. Great discretion, however, is required as to the quantity of salt to be used in agriculture. Salt manure is good on light, sandy, siliceous soils, half a ton to an acre is quite sufficient and is to be applied three or four months before the sowing time. The very fact that salt is present in plant ashes proves that plants require it. Mr. Arthur Young, an outstanding figure in the history of English and even European agricultural renaissance, considered salt of great value as fertilizer.

Salt has germicidal properties as well. These make it invaluable to the farmer, planter and florist alike. To the coffee planter it possesses a great boon in its deadly effect on the coffee borer—a pest responsible for serious damage to coffee plantations. It kills many parasitic fungi that starve the growing and delicate plant; analogous to this is its property of destroying weeds in the fields that struggle with the cultivated vegetation to wrest nutriment from the soil.

Another branch of economic activity in which salt is indispensable is fish-curing. It is a preservative, has the valuable property of preventing putrefaction in dead organisms and is consequently used for fish-curing all over the world. Fishing encourages sea-faring life. A flourishing fishing industry thus has an important bearing not only on the establishment of a mercantile marine, but also on the maintenance of a regular navy. By virtue of the same property salt is used for food preservation and pickles, etc. As an important item of food processing industries, it is also required for meat packing, dairy products and fruit and vegetable canning.

The use of salt in modern industries is equally or perhaps more important. A number of arts and manufactures of modern civilization owe their existence to salt. In short, salt is indispensable to industrial advance. This is so as modern industrial science is, in essence, applied chemistry and chemicals are in the main: salt. Martin Smith and Milson in "The Salt and Alkali Industry" say, "From salt as the parent substance, there spring the huge industries, which are concerned with the manufacture of sodium sulphate, hydrochloric acid, sodium carbonate, caustic soda, chlorine, hydrogen, etc.". These in their turn support the superstructure that enables every modern convenience for a civilized life to be provided. Out of these "spring industries concerned with the manufacture of soap, glass, glycerine, dynamite and other nitroglycerine explosives, bleaching powder, chlorates, etc. These products in their turn form the raw materials of great trades which ramify one into another in a way which is difficult for the non-technical reader to realise". Salt is used in various other industries such as dyes, glass, pottery and for assaying in mints. It is used in ice machines, tanning (curing hides), bleaching oils and preservation of timber. It is also used by colour manufacturers, zinc founders and ship-builders. The textile and paper making industries require chemicals for bleaching and sizing and cheap soap for scouring—all these are derived from salt as the basis.

Salt finds many important uses in medicine as well. Salt is given internally in many diseases. Its antiseptic properties make it useful in surgical operations. It is also used in veterinary practice. Salt baths

or baths in sea are said to have a stimulant effect on the skin. The medicinal properties of mineral waters are in no small degree due to the presence of salt.

Last, but not the least, salt is a valuable source of public revenue. Many civilised States derive a handsome income from duty on salt. Its advantage is that it reaches every member of the community and thus every person pays his quota to the State and spread over a large population it yields a handsome revenue. India consumed about 6 crores of maunds of salt per annum before 1947 when there was duty on salt, and the net revenue at the then rate of duty (Rs. 1/9/-per maund) amounted to about 9 crores of rupees.

CHAPTER III

COMMON SALT—GEOGRAPHICAL DISTRIBUTION AND ORIGIN

(a) GEOGRAPHICAL DISTRIBUTION

Salt is a mineral of universal distribution and, fortunately, it is a commodity easy to obtain. There is no possibility of its ever being exhausted. Salt occurs dissolved in sea, in springs, in lakes, stored in the earth in mines, spread out in swamps or efflorescing on plains in every part of the world. The universal presence of a necessity of life like salt is looked upon as an evidence of design in the creation of the world.

The sea is the biggest store-house of salt. Common salt forms 76 per cent of the total salts dissolved in sea. It has been estimated that the sea contains about 58,000 cubic miles of salt.

Salt Lakes.—Salt lakes are another store of salt and exist in almost every part of the world, though they are more numerous in the northern regions than in temperate or tropical zones. In Central Asia we find only salt lakes. Elton in the Kirghis, Kosiak in Asiatic Russia and Inder in Ural river are a few well-known lakes. Besides these there are others in the steppes of Asiatic Russia. The Dead sea is an important salt lake in Palestine and Lake Oroomiah in Persia. There are numerous lakes in Tibet and a number of them exist in the northern end of the Black sea. In India the Sambhar Lake in Rajputana is well-known; now-a-days it yields about 80 lakhs of maunds of salt per annum. In addition to this there are Pulicat and Chilka lakes which are situated on the Coromandal Coast. Africa, Australia and America have several salt lakes; Lake Utah in America and lake Austen in Australia are well-known. There are several salt lakes on the pampas of Laplata in South America. In the island of Cyprus there are extensive salt lakes near Larnaca, the Capital.

Brine springs.—Brine springs, which are subterranean streams of water impregnated with salt from percolating through saliferous strata are found in many parts of the world. There are brine springs in New York, near Syracuse, in Java Island, in Cheshire, Staffordshire and Durham in England, and in Germany. Salt deposits of lake Inder in the Asiatic steppes of Russia have been formed from brine springs. In the north of Pakistan, brine springs are met with at the foot of hills in the Trans-Indus Salt Range. They also exist in China, Italy and Switzerland.

Spontaneous salt.—Spontaneous salt or naturally formed surface salt is found everywhere. It is met with in Australia, America, Peru and Chile and in the steppes of Russia. In India spontaneous salt occurs in the Uttar Pradesh and on the Coromandal Coast in Madras and in Burma. In the great desert of Mongolia many square miles of the country are spread with salt incrustations. Spontaneous salt contains nitre and salt in varying percentages.

Rock salt

Rock salt is met with and mined in many countries. The most extensive deposits in the world are those formed on the continent of Europe extending over 500 miles along the Carpathian mountains, stretching out laterally for 100 miles, and having a thickness of 1,200 feet in some places.

This range comprehends the mines of Wallachia, Transylvania, Galacia Upper Hungary, Tyrol and Germany. The Wieliczka Mine, the largest salt mine in the world, which has been worked for over 700 years, is well-known. The salt mines in Rumania have also been worked for centuries. In England Cheshire salt deposits have been worked for over 200 years. There are valuable mines of salt in France and Greece as well. In America rock salt is found in Virginia, Nevada, the Andes and the Allegharnes. In Africa it is found in Algeria, Tunis, Morocco, Abyssinia and in the salt rocks of Tegaza west of Sahara desert. Rock salt is also found in Tibet, Burma and Siberia. In Persia rock salt is found near Ispahan and in the island of Ormuz.

In Pakistan extensive rock salt formations exist in the Punjab and the North West Frontier Province. The Punjab Salt Range contains some of the richest deposits of rock salt in the world. The cis-Indus Salt Range is about 130 miles long and 5 miles broad. Here the thickness of the salt bearing strata varies from 400 feet to 900 feet. The Khewra salt mine is the biggest mine in this Range. The trans-Indus Range extends beyond the Indus to the N.W. Frontier Province. Its area is 1,000 square miles. About one-fifth of the entire area is taken up by salt. In India rock salt deposits are found in Mandi in Himachal Pradesh. Salt bearing formation outcrops extensively along the western flank of the mountain Gokhar-ki-Dhar along the main boundary fault from Jogindernagar to Mandi. There are indications of continuous saliferous deposits along the range for a distance of about 25 miles. Mining is done at Guma, while quarrying at Drang and Maigal. The deposits of rock salt in the known formations are estimated to be 500 cubic miles.

It will thus be seen that beds of rock salt and brine are common in nearly every country in the world. The following table shows the distribution of rock salt and brine in the world according to their Geological ages:—(Table taken from 'Salt deposits of Canada and the Salt Industry' by L. Hebercole).

Geological Formation.	Localities.	
	Brine.	Rock salt.
Recent	California (sea water); Utah; Arabia; South American States (sea water); shores of Dead Sea; Algeria; Mexico (sea water); Portugal (sea water).	Utah; Nevada; New Mexico; Kirghiz steppes; Arabia; Chile; Columbia.
Tertiary	Armenia; State of Tamaulipas, Mexico; Java, East Indies.	Louixiana; California; Cordona Spain; Wieliczka and Bochnia, Austria-Hungary; Siebenburgen; Asia Minor; Armenia; Lungro; Italy; Rumania; Volteria, Italy; Kulusz; Galicia; Transylvania; Caucasus Mts.; Salt Range; Pakistan* Persia.

Geological Formation.		Localities.	
		Brine.	Rock salt.
Cretaceous	Westphalia; Algeria; Kansas; Texas; State of Puebla, Mexico; State of Coahuila, Mexico.		
Jurassic			Rodenburg on the Deister; Bex, Switzerland; Cerro de Pasco-Peru.
Triassic—			
Upper	Worcester, England; Cheshire, England.		Nancy, France; Halle, Berchtesgaden, Hallein, Aussee Tyrol; Cheshire, England; Antrim, Ireland; Isle of Man.
Middle			Wurtemberg; Thuringia, Ernsthall, Stottenrheim; Canton of Aargau, Switzerland.
Lower			Schoeningen, near Brunswick, Salzderhelden.
Permian	Russian salines		Stassfurt, Germany; Texas; Oklahoma; Hanover; Heilbronn.
Carboniferous	Nova Scotia, New Brunswick, Canada; Michigan; Ohio; West Virginia; Texas; Pennsylvania; Nebraska, U.S.A.		Durham and Bristol, England; Kansas; Texas; Virginia; Oklahoma.
Devonian	New York (Ordovician to Devonian; Alberta, Canada*; Manitoba, Canada*; Yeneseisk, Siberia; and Irkutsk, Siberia		
Silurian	Manitoba, Canada* Szchuan, China*		Ontario, Canada; Michigan New York; Ohio, U. S. A.

NOTE.—The sign (*) after a locality means that the age of the deposit is not definitely determined.

(b) ORIGIN

(i) Rock salt

The origin of rock salt is one of the enigmas of nature. It has long been of academic interest and many theories have been propounded to account for the different forms in which salt deposits occur.

Volcanic theory.—Vulcanism or Volcanic action—the phenomena connected with the ascension of heated materials from the earth's interior to its surface—has been made use of in numerous cases to explain the origin

of many mineral deposits. It was early applied to explain the origin of salt deposits, especially since hydrochloric acid and sodium chloride were proved to be present in the emanations from volcanoes. The absence of organic remain in rock salt and its association with unburnt coal, gypsum, naphtha and petroleum rule out this theory.

Aqueous theory.—The theory that salt deposits are the result of deposition from sea waters, is the present accepted theory. The frequent occurrence of bodies such as bitumen and organic remains and of cavities containing liquids and in some cases gases in almost all varieties of rock salt furnish indisputable proof of the deposition of this substance from its aqueous solution. The occurrence of sand-stone pseudomorphs in the cubical form of rock salt also favours this opinion. Moreover, the same salts are found associated with rock salt as are found in the sea, for instance, calcium, magnesium and sodium sulphate, potassium and magnesium chloride. Salt deposits occur as if they formed in a basin—they are thickest in the centre and thin out towards the edges. Sometimes they are irregularly formed. This general character of the deposits is a strong argument in favour of their aqueous origin. The deposits rarely occur in the form of dikes or masses filling vertical fissures which is the usual form assumed by molten mass projected upwards from the interior of the earth. Salt is itself a sedimentary rock and stratification is one of the distinctive marks of the aqueous origin of a rock. The presence of gypsum in close association with it is another argument in support of this theory. It is said that homogeneous, transparent and crystalline structure of rock salt met with in mines is unlike any product made from the evaporation of brine. This argument against the aqueous theory, however, falls to the ground, as we see massive deposits of rock salt at the bottom of some salt lakes, for instance, Lake Inder, even at the present day. These deposits show that under certain conditions crystalline and massive masses of rock salt may form on the evaporation of brine. Another argument advanced against this theory is the absence of fossils in rock salt. This is easily explained. Life cannot exist in a brine of certain density and as the brine got concentrated, all animals must have run away. It is believed that the crystallization of salt must have taken place at great depths and then movements of the earth's crust and upheavals must have raised the low lying areas.

(ii) *Natural brines*

Natural brines are found in many parts of the world; and many theories have been put forward to account for their origin. The most important theories may be classed as follows:—

- (a) The leaching out of salt beds by meteoric waters.
- (b) The leaching out of salt crystals disseminated through stratified rocks.
- (c) From original sea water enclosed or imprisoned in a porous stratum.

The variations and combinations involved in these theories, however, are so numerous that it is almost impossible to assign any definite origin to any one brine occurrence.

(iii) *Salt lakes and salt marshes.*

The salt lakes and salt marshes owe their origin to the overflow and subsequent retirement of the sea water, the sites having been originally the bed of the ocean. When the ocean receded to its present levels, it left in the depressions of land volumes of water of various depths, elevations, extents of surface, according to their deepness, altitudes and angle of declivity. Thus the great Salt Lakes are the remains of the inland sea. At one time the low-lying country west and north of the Caspian Sea was part of the Inland Sea, its surface contracted by shrinkage and the retreating water was left in numerous swamps which now form salt lakes.

CHAPTER IV

TECHNOLOGY OF MANUFACTURE

A.—METHODS OF MANUFACTURE

The process of obtaining salt (sodium chloride) and other substances which are dissolved in sea water or natural brines is entirely one of gradual evaporation and fractional separation of solids at different degrees of concentration. Most of the natural brines contain the same salts as those found in sea water. If these brines are reduced in strength to the same density as sea water, the composition of the two is very nearly alike.

The different methods by which common salt can be produced are:—

- (a) by solar evaporation of either sea water, natural brine from lakes or wells or brine obtained by lixiviation of salt earth;
- (b) by artificial evaporation of brine in open pans either by direct fire or by steam or in vacuum evaporators;
- (c) by freezing of sea brine which results in saturated brine and separation of salt. This method of manufacture is followed in countries of North Europe having excessive cold climates;
- (d) by mining rock salt either by dry mining methods or in the form of saturated brine by injecting water through tubes sunk into the deposits of salt. From the saturated brine, salt is recovered by artificial evaporation.

These methods are utilised to different degrees depending upon the prevailing climatic conditions, the geographical location of the sources and the advancement of technical knowledge and its application. In the Western Hemisphere where prolonged dry weather is uncommon, solar evaporation of either sea water or natural brine is not so feasible and salt is produced by dry mining of salt deposits or by artificial evaporation of brine. In tropical countries, where long dry periods exist the manufacture by solar evaporation is resorted to. In the United States of America, the production of salt by solar evaporation constitutes less than 4% of its total annual production of 13.5 million tons. Notwithstanding the technical advancement in artificial methods of evaporation, manufacture by solar evaporation is still in use in California. Likewise, in some of the European countries like Spain, Italy and France where a long dry season exists on the coastal areas, salt is produced by solar evaporation of sea water. In India the entire production of about 3 million tons, with the exception of the negligible quantity of rock salt produced at the Mandi mines, is obtained by solar evaporation, as nature has endowed India with an extensive sea board with long periods of dry weather which aid natural evaporation.

B.—FACTORS GOVERNING EVAPORATION

Evaporation is the chief operation involved in the concentration of a weak brine to saturation. The factors affecting evaporation are:—

- (a) Vapour pressure and temperature.
- (b) Dissolved solids.
- (c) Wind velocity.
- (d) Surface of exposure.
- (e) Importance of Temperature.
- (f) Impermeability.

(a) *Vapour pressure and temperature*—It depends on the temperature and rises with it. When the vapour pressure is equal to the atmospheric pressure, the liquid begins to boil. The tendency of a liquid to evaporate is judged by its vapour pressure. Air has a certain amount of water vapour in it and so the extent of evaporation depends on the vapour content or relative humidity.

(b) *Dissolved solids*—The presence of a salt in a solution alters the vapour pressure of a liquid. The rate of evaporation decreases with rise in concentration of salts in a solution. Weak brine loses its water more readily than a strong brine.

(c) *Wind velocity*—Evaporation also depends on wind velocity. When wind is blowing the layer of air in contact with liquid changes constantly and more water evaporates.

(d) *Surface of exposure*—Evaporation also depends on the extent of the surface exposed. A shallow layer concentrates more readily than a deeper layer

(e) *Importance of temperature*—On the rate of evaporation depends the character of the salt produced and the capacity of the pan. This is proportional to the difference between the partial pressure of the brine at its surface and the partial pressure of the water vapour in the air contact with it. The partial pressure of the brine is a function of its temperature only since it is saturated, and for uniform quality it is, therefore, imperative that the temperature be maintained between fairly narrow limits. During operation the brine is kept as still as possible, the only motion being the trickling in of fresh brine to maintain the volume and the motion of convection currents in the neighbourhood of the fires. The salt slowly drifts to the lower end, the "back-end" of the pan.

(f) *Impermeability*—Since brine has to be concentrated by long exposure over extensive areas, it is imperative that it should not be allowed to percolate through the soil and necessary precautions should be taken to prevent such leakage. Brine increases in value as the concentration rises because of the money, time and solar energy spent on it and loss of this brine volume for volume, means a much greater loss of its salt content. The prevention of leakage becomes increasingly more important with the rise in concentration of the brine and, therefore, greater care has to be taken to prevent leakage in the crystallising beds than in the earlier stages. The soil must be impermeable, but where it is not so it must be made impervious by artificial treatment such as a top dressing of plastic clay.

In short, it may be stated that the yield of salt from a solar evaporation area, assuming a sufficient supply of brine exists depends on the initial density of the brine, on the number of days in the year during which evaporation can take place, the length of these days, the average temperatures, and humidity, dew point and wind velocity during those days. These are the primary natural factors controlling actual evaporation but, in addition to these, the yield will be determined by the layout of the works, particularly as regards the correct proportion of condenser to crystallising surface, the method of collection of the salt crop, whether by single irrigation or by accretion, the number of crops extracted in a season, the speed of extraction and cleaning of pans, the suitability of the soil in respect of percolation and numerous other points.

There are formulae such as the Fitzgerald and the Pole equations by the use of which evaporation of water can be calculated theoretically, but there is no evidence to show that the results of calculation on such

formulae can be correctly applied to concentrated solutions of brine. Moreover, where it is possible to calculate evaporation by this method, it would be unsound to infer the rate of deposition of sodium chloride from the loss in volume so deduced.

The natural factors affecting evaporation are, as noted above, rainfall, temperature, humidity and wind velocity and of these the rainfall, limiting as it does the length of the season during which manufacture can proceed, is by far the most important. The rate of evaporation of brine can, to some extent, be accelerated by addition of certain chemicals, such as Solivap Green.

C.—CONTROL OF OPERATIONS

In any manufacturing operations, the quality of production can be controlled easily if there is a ready and convenient method of measuring the degree of changes that take place. A chemical analysis for ascertaining these changes progressively would be a laborious process which cannot be used conveniently in a manufacturing operation. The density of salt solutions varies directly with the concentrations or from a determination of its density. The changes in density thus give a very good indication of the progress of evaporation and how the resulting solution can be expected to behave if these changes were allowed to continue.

When a salt is dissolved in water the weight of the solution is always equal to the sum of the weights of the water and the dissolved salt. The resulting volume, is, however, not equal to the sum of the volumes of the water and of the salt dissolved in it. As the particles of a dissolved salt distribute themselves uniformly in the water, the volume of the latter is altered only slightly. The extent of the slight variation is different with different salts.

D.—TECHNICALITIES OF SALT MANUFACTURE

To enable the reader to understand the technicalities of salt manufacture it must be considered under two heads: theoretical and practical. In connection with the theoretical part a mention of Beaume's hydrometer is given below as this instrument plays a very important part in the manufacture of salt.

This instrument is indispensable to the salt manufacturer. It tells him how the evaporation of his brine is progressing, and what changes are taking place in it. It is of very simple construction. It consists of a weighted glass bulb with a projecting graduated stem, which floats erect in solutions heavier than water, at different levels according to the density of the solution, showing by the graduation on its stem the density of the fluid. There is another Beaume's hydrometer for alcohols and fluids lighter than water, which is only mentioned here, to prevent its being mistaken for that used in salt manufacture. The latter is graduated as follows: The point to which the stem sinks in distilled water at 60° Fr. is marked 0°; then 15 parts of common salt are dissolved in 85 parts of water and the point to which the hydrometer sinks at the same temperature is marked 15°; the interval between 0° and 15° is then divided into 15 equal degrees and the scale is further continued to 40 by means of similar equal parts. 0° Beaume is, therefore, equal to distilled water and 15° Be. to 15 per cent of salt in a simple solution. In a complex solution, other salts

influence the density and consequently the reading of the hydrometer; but as regards sea water, the value of each degree as far as salt is concerned, is known by experience. Solids in suspension make no difference. The hydrometer reads much lower in muddy river water than in clear sea brine.

Impurities

As a preliminary to the consideration of the subject of salt manufacture from the sea, it is necessary not only to be acquainted with the various salts it contains but also to study their behaviour and mutual reactions in solutions of various degrees of concentration at different temperatures; for, upon this depends the process of manufacture, which will be described in detail. These salts are:—

Magnesium Chloride.

Magnesium Sulphate.

Calcium Sulphate.

Magnesium chloride exercises a potent influence on salt. Magnesium sulphate can be easily avoided in the manufacture of salt. Calcium sulphate is present in minute quantities. We shall presently consider how these salts are managed in salt culture so as to admit of pure sodium chloride being obtained. This depends on their solubility. Any number of soluble salts, which do not mutually decompose each other, may exist coincidentally in a given bulk of water, if there be sufficient water to dissolve them all; but as we diminish the quantity of water, the salts will separate, the less soluble first and the others according to their degree, until a point is reached—complete saturation—when those remaining are thrown down together. The diagram of the curves of solubility of the different salts concerned given on the opposite page will illustrate and explain the further remarks on this subject.

It will be seen that the solubility of sodium sulphate is extremely sensitive to temperature. At low temperature it breaks up. As the temperature rises, it gets dissolved again. Calcium sulphate is so little soluble that it separates long before sodium chloride approaches saturation. The practical effects of these curves of solubility are shown in the evaporation of sea water. Calcium sulphate is the first salt to separate. It starts separating at 17° Be. Sodium chloride is the next to separate and starts separating from 25° Be.

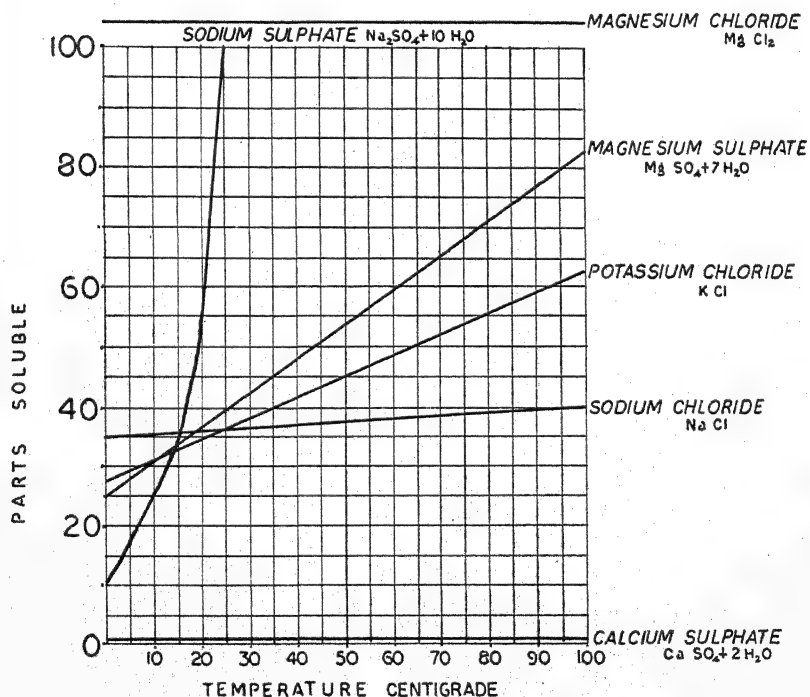
E.—CONCENTRATION OF SEA WATER AND BRINES—STAGES

The process of concentration may be divided into seven stages. Each stage represents a distinct change in the resulting liquid:—

- | | |
|-------------------------------------|----------------|
| (1) Between 3·9° Be. and 10·0° Be. | } Unsaturated. |
| (2) Between 10·0° Be. and 17·0° Be. | |
| (3) Between 17·0° Be. and 24·5° Be. | |
| (4) Between 24·5° Be. and 29·5° Be. | |
| (5) Between 29·5° Be. and 35·0° Be. | |
| (6) Between 35·0° Be. and 37·0° Be. | |
| (7) Between 37·0° Be. and 38·5° Be. | |

First Stage—Sea water is generally found to have a specific gravity of 1·025 to 1·029 at 25° C. corresponding to 3·5 to 4° Be. Usually we get on the Indian littoral 3·9° Be. By gradual evaporation of sea water the original volume is reduced to 37 per cent when the density reaches 10° Be.

DIAGRAM OF SOLUBILITY IN 100 PARTS OF WATER



Second Stage—After the separation of calcium carbonate the liquid remains unsaturated till it reaches a density of 17° Be. The original volume of the sea water is now reduced to 20 per cent or one-fifth of the original. Gypsum and the remaining calcium carbonate and sometimes also magnesium carbonate are very often noticed to separate out at 12° Be.

Third Stage—When the concentration has reached 17° Be. calcium sulphate begins to separate out as gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$). The separated gypsum at first floats on the surface of the liquid as a thin grey film and when it has sufficiently accumulated it settles down to the bottom on the pan, carrying along with it a little salt which just begins to come out when the major portion of the gypsum ceases to separate. The separation of gypsum continues up to 25° Be. in the Rann of Kutch, from which Khara-goda and Kuda brines are obtained, there is a layer of about 3" of gypsum under the clay strata. This calcium sulphate seems to have been separated out from the original sea water by its spontaneous evaporation.

Fourth Stage—This stage begins at 24.5° Be. Pure salt solution is saturated at 26° Be. when the percentage of salt in solution is 25.5. But in the presence of other dissolved salts, the solution behaves as if it is saturated at 24.5° Be. when salt begins to separate out. As the evaporation proceeds for every 100 grams of water evaporated from the saturated solution, 36.5 grams of sodium chloride are thrown out of solution. The solubility of sodium chloride being 36.5 grams at 30° C. in 100 grams of water, the percentage of salt present in the saturated solution would be:

$$\frac{36.5}{(100 + 36.5)} = 26.74 \text{ per cent by weight. Thus for every}$$

100 grams of saturated solution we have 73.26 grams of water and 26.74 grams of salt. It is well-known that the total quantity of salt originally present in the brine is not entirely separated when the density has reached 28.5° Be.

Separation of Sodium Chloride

$^{\circ}\text{Be.}$	Total dissolved	Total Separated	Per cent separated
3.5	29.696	..	..
25.0	29.696	..	..
28.5	8.889	20.807	70.0
32.4	3.993	25.703	86.6

Fifth Stage—When the bitterns are drained out from the crystallizing pans at 29.5° Be. they contain various salts in solution. These salts are at 29.5° Be. very near their point of saturation. For this reason the bitterns require very careful treatment. As the original volume of sea water has contracted to 2 per cent when it has reached 29.5° Be. it will be more convenient to take the bitterns of 29.5° Be. as the starting liquid for the calculation of volume in the subsequent stages of evaporation. As the evaporation proceeds, solids continue to separate out. The deposits obtained up to 36° Be. consist mainly of sodium chlorides and sulphates. It will be noticed from the solubility curves that magnesium sulphate and potassium chloride are soluble practically to the same extent at the ordinary temperature of the air (25°C). Their separation from saturated solution is very difficult.

From the tables showing the analysis of the various crops obtained from sea water and Kuda brines, it will be noticed that sodium chloride is the principal salt to separate out up to 35° Be. It continues to come out at normal temperature in the subsequent stages. 97.1 per cent of salt remaining in the bitterns - at 29.5° Be. is removed when the concentration reaches 35° Be.

Sixth Stage—This is a very important stage in the recovery of byproducts. At this stage potassium salts and magnesium sulphate and also sodium sulphate are recovered if the process of separation is worked out carefully.

Seventh Stage—This stage is in every way as important as the previous one. If it is desired to recover bromine from the bitterns it is advisable to pass chlorine in the bitterns at this stage rather than at the final stage.

F.—SUB-SOIL BRINE

The largest single source of sub-soil brine in India is the Rann of Kutch. There are many salt works in this area, the biggest being at Kharaghoda, 20 miles from Viramgam, owned by the Government of India. There are several works at Kuda, near Dharangadhra. The multiple irrigation system is followed in these works. Brine is lifted manually from wells which are 20' to 30' deep and about 9' to 10' in diameter. The brine varies in density from 10° to 20° Be. The wells are usually not located near the crystallising pans, and the brine is led by gravity through long channels into reservoirs and condensers. The brine is led from the reservoirs by gravity to crystallisers, measuring 250' × 80', laid parallel to the reservoirs. The pans are puddled and tamped to make the bottoms hard. Initially they are filled to a depth of 2" to 3" and this level of brine is maintained above the layer of salt. In the pans the density is not allowed to rise above 26° Be. This is done by admitting the brine slowly and from time to time. The initial layer of salt is broken and raked by special wooden rakes to prevent the formation of flakes. The crystals are raked and spread on alternate days till the salt is ready for harvest. After about one and a half months from the date of initial feeding, further supply of brine is stopped and bitterns are drained out into pits known as *faraps*, and the pans are recharged.

The salt is harvested when the crust is 8" to 12" thick. The salt crystals are about $\frac{1}{2}$ " to $\frac{3}{4}$ " in size and are dense and hard. The salt is known as Baragra salt. The results of the analyses of the salt produced at Kharaghoda and Kuda are given below:—

Composition of salt from Kharaghoda and Kuda

	(Dry basis; average of 5 samples)	
	Kharaghoda %	Kuda %
Sodium chloride	97.10	96.02
Calcium sulphate	1.36	1.43
Magnesium sulphate	0.24	1.02
Magnesium chloride	0.98	0.89
Magnesium bromide	0.02	..
Potassium chloride	0.08	..
Insolubles	0.13	0.26
Undetermined	0.09	0.38

Salt is also manufactured from sub-soil brine in certain areas in Travancore and Madras States.

G.—LAKE BRINE

The most important source of lake brine in the country is the Sambhar Lake. The salt works are laid out on the banks of the lake and are called *kyars*. Each *kyar* has its own reservoirs, condensers and pans. Soon after the monsoon the lake is full of fresh water, and the salinity of brine is low. But gradually the density of the brine rises up to 3° Be. A dam is built across the deepest part of the lake, enclosing an area of 5 sq. miles; this serves as the main reservoir and conserves the concentrated brine from getting diluted. When the density of brine in the lake rises to 3°—5° Be., it is pumped into reservoirs. When the density of the brine in the reservoirs reaches 5°—8° Be. it is led into subsidiary reservoirs attached to different *kyars* whence it is taken to condensers where it is allowed to remain until its density rises to 15°—20° Be. The concentrated brine is finally led to crystallizers, 3 to 7 acres in area. The supply of brine from the lake is supplemented by sub-soil brine tapped from percolation canals situated on the edge of the lake. The density of this brine varies from 8° to 19° Be.

The separation of salt begins in the crystallizers at 26° Be. When the density reaches 29° Be., fresh brine is admitted to maintain the density at 26° Be. The deposited salt is scraped by iron spades, heaped on the crystallizer beds and washed in the *bitterns*. This salt is known as *kyar salt*. Only one crop is obtained per season. The *bitterns*, which are rich in sodium sulphate, sodium carbonate and bicarbonate, are drained into separate reservoirs.

In addition to *kyar salt*, two more varieties are manufactured, namely *reshtha* and *pan salts*. *Reshta salt* is the wind-swept salt formed when the salt crystallizing on the surface of the brine is blown to the edges where it collects as tiny crystals. It is also formed in the *bitterns* area where the salt separates out from the brine formed by the dissolution of *bittern salt* in rainwater. This constitutes an important source of salt. *Pan salt* is also obtained from well brine by a method similar to that adopted in Bombay and Madras. The composition of the different varieties of salt is given below:—

Composition of salt from Sambhar Lake

	(Dry basis)		
	Kyar salt %	Reshta salt %	Pan salt %
Sodium chloride	96.36	97.59	95.48
Sodium sulphate	2.39	1.03	1.63
Sodium carbonate	0.46	0.40	0.72
Sodium bicarbonate	0.08	0.36	0.93
Insoluble	0.26	0.42	0.89
Undetermined	0.45	0.20	0.35

H.—ARTIFICIAL EVAPORATION

A large quantity of salt is produced in the world by artificial evaporation of brines from different sources, using the heat obtained by the burning of fuel to effect rapid evaporation. Artificial evaporation has not been practised in India, except in primitive small-scale production of salt in Bengal and Orissa. This evaporation may be carried out either under the ordinary atmospheric pressure in open pans or under reduced pressure in vacuum pans heated either by steam or by electricity.

I.—OPEN PAN EVAPORATION

In the early days brine was evaporated in iron kettles 3' to 6' dia., heated from below, and the salt lifted by drain boards. This method was replaced by the open or direct-fired pans made of sheet steel, 150' long and 16'—20' wide. The pans were set 16' above the floor over a furnace fired with coal, wood or gas. This process is now obsolete; but, in some parts of Bengal and Orissa, it is still employed on a small scale. This is known as the *punga* process.

The second process of artificial evaporation is the Burma Process and is the combination of solar and artificial evaporation. The sea brine is concentrated by solar evaporation and it is then evaporated in open pans in which, it is claimed, salt of different grades and of greater purity is obtained by regulating the temperature of crystallisation. The Salt Experts Committee, however, did not recommend the introduction of this method in India.

J.—GRAINER PANS

Most of the open pan salt is produced in grainers in which heating is carried out by steam. Originally the grainers were made of wood and the salt was raked manually. These are now replaced by hollow steel pans 180' long \times 18' wide \times 18" deep, with a production capacity of 80 tons per day. Brine is heated with submerged steam pipes, 4" dia. running along the entire length of the pan. A scraping-and-conveyer system along the bottom continuously advances the salt and elevates it to a drain board. The salt is eventually discharged into a monel metal launder or trough, from which it is lifted by a slurry pump to a crystal washer. The salt is dried on a rotary filter with hot air to a moisture content of 0.1 per cent. It is then passed over a vibrating cooling conveyer and then through rollers which break up the lumps. The salt is then ready for screening and packing. In efficient plants about $\frac{1}{4}$ lb. of salt is made per pound of steam consumed. The grainer process is not employed in India.

K.—VACUUM PAN SYSTEM

By far the largest proportion of evaporated salt is produced by boiling the salt brines in an evaporator. There may be only one evaporator body (single effect) or up to four evaporators can be connected in series so that the steam produced in the preceding evaporator body is used as the heating steam in the following evaporator (multiple effect evaporation). Thus a quadruple effect evaporator can theoretically evaporate four pounds of water from brine for every pound of steam fed to the first effect. However, thermal losses decrease the steam economy to somewhat over three pounds of water evaporated by each pound of steam. This is approximately equivalent

to the production of one pound of salt per pound of steam. A vacuum pan salt refinery can be successful only if there is a large demand for high-grade salt, since the use of such evaporators involves a heavy capital outlay and maintenance is costly.

The vacuum pan is made of cast iron, 18'—20' in dia. and 38' high. The various rings and cones are cast in segments, accurately machined and bolted together without gaskets. The steam belt is placed in the cylindrical part which consists of a ring-shape belt of several hundred vertical copper tubes about 5' long and 2" in dia. A typical pan would have about 7,000 to 8,000 sq. ft. of heating surface. A centre well 10'—12' dia. is left in the heating section. A large propeller, suspended from the top by a shaft and reaching the bottom of the well, helps to maintain circulation of brine. Low pressure steam rarely exceeding 10 lb. sq. in., is admitted to the first pan. The vapours are led from one pan to the next and finally condensed. A high vacuum is maintained in the last pan.

The salt slurry is pumped out of the bottom of each pan to a separate tank bolted to the side of the pan. The slurry is dewatered and dried on a rotary top feed filter at c. 175° C. The salt produced by this process consists of small transparent uniform cubical grains and is 99.7 per cent pure.

L.—THERMO COMPRESSION

This name is given to a new technique of vacuum evaporation. In a multiple effect evaporator the vapours given out from the first effect are utilised for heating the subsequent effects, but these vapours can be utilised again to heat the same effect provided they are compressed to the pressure of the heating steam. Greater heat economy is obtained by this method than in a multiple effect evaporator, but the consumption of power in compressing the steam has to be considered against the saving in fuel brought about by this heat economy. The cost of fuel saved compared with the cost of power consumed is the deciding factor in the adoption of thermo compression. It is of special advantage where cheap hydro-electric power is available and coal is comparatively costly. Thermo compression is claimed to provide other advantages also namely: simplicity in working, maintenance of uniform boiling pressure in the evaporators and lesser attention than in multiple effect evaporators.

M.—FLASH EVAPORATION OR ALBERGER PROCESS

If vacuum is applied to a brine solution until the external pressure is less than the vapour pressure of the solution, boiling occurs. Latent heat of vaporization for the water evaporated must be available, so if no external heat is supplied (an adiabatic process is carried out), the latent heat must be taken from the liquid remaining. Thus evaporation and cooling of the brine occur simultaneously. The Alberger Process used in the salt industry employs this principle in a rather elaborate system to utilize the steam evolved when the pressure on the brine is reduced. Removal of calcium sulphate is another unique feature. This process produces salt of a distinctive grain size and shape, and of high purity. In this process unpurified brine is used. The brine is heated to 143° C. and passed through a cylindrical vessel filled with stones, called graveller, where calcium sulphate gets deposited. The superheated brine then passes on to three vapour flashers arranged in a series. The salt crystallises out in the third flasher

and is taken out in the form of slurry into a circular open pan. The slurry is centrifuged and the extracted brine is recycled. The salt obtained analyses to 99.95 per cent sodium chloride. This process is expensive and is used only when granular salt of high purity is required.

N.—FREEZING METHOD

During World war II, Japan developed a novel process of producing salt and ice simultaneously from sea water by ammonia refrigeration, and a powder ice plant was developed. In this process ice separates out leaving a saturated solution of salt which is artificially evaporated to produce salt. For every 3 tons of salt produced about 100 tons of ice are separated out. This process can be operated only in places where there is a heavy demand for ice.

O.—MINING OF ROCK SALT

Rock salt is obtained either by dry mining or by the wet brine well method depending upon the quality and the thickness of the deposit to be worked. The dry mining method is preferred where deposits occur on the surface, but when they occur at a depth, the brine well method is economical to use, since it gives salt of better quality. In the United States most of the salt from mines is obtained by the brine well method; the brine obtained is directly used in various industries.

(a) *Dry Mining Method*—This method is suitable where the thickness of salt deposit is large, such as in salt domes. In such cases the chambers and corridors within the mine are more than 60' high. This permits the use of large mechanical shovels for excavating salt and depositing them in the corridors. Where the salt strata are not thick, the chambers and corridors are only 10' high, and the salt is mined by undercutting and side shearing a large block with mechanical saws. The block is then blasted. Electrical equipment is used to handle and transport the salt. Salt is crushed, screened and graded before packing.

(b) *Wet Brine Well Method*—Very few wells operate on natural underground brine; usually water is pumped into the wells to obtain the brine. In recent methods, water is forced down the well with multiple stage high pressure pumps, and the brine comes out from the wells automatically. The air pressure is maintained in the wells by two stage air pumps running intermittently or continuously. A well that has been properly developed and sealed holds its pressure for days.

P.—MANUFACTURE IN INDIA

In India, salt is produced by solar evaporation of sea brine all along the coast line around Bombay, Saurashtra, Kutch, Madras, Orissa and Travancore States. The density of the brine varies from place to place but is usually 3° Be. Two methods are followed : (1) Single irrigation and (2) Multiple irrigation.

(a) *Single Irrigation Method*.—In this method the sea brine is admitted into reservoirs during high tide where it is allowed to attain a density of 5° Be. It is then transferred to condensers where its density rises to 10°—16° Be., and then to crystallising pans. The precipitated salt is scraped by wooden 'pawdis' once or twice a week. The density of the mother liquor in the pans at this stage rises from 30° to 31° B. After the crop is harvested the bitters are allowed to remain in the pans and a fresh charge of brine

is led in and the deposited salt is collected. This system is being employed in most of the salt works to avoid the danger of losing the crop due to rains.

The salt manufactured by the above method is of two kinds the light or the *Mapi* and the heavy or the *Vajni* varieties. The first variety is obtained by charging the crystallizers to a depth of $1\frac{1}{2}$ " to 2", while the other is obtained with a charge $2\frac{1}{2}$ " to 3" deep. A third variety, known as *Kuppa* or Flake salt, is also manufactured in the Bombay area. In this method ropes made of grass are stretched across the crystallisers dividing the surface of the bed into small sections. Salt flakes are formed at the surface of the brine which gradually settle down to the bottom. This salt is white and light. The composition of the different varieties of salt is given below:—

Composition of different Varieties of Salt

	(Dry basis)		
	Light or Mapi %	Kuppa, %	Heavy or Vajni %
Sodium chloride	90.85	94.52	92.23
Calcium sulphate	1.43	0.63	1.10
Magnesium sulphate	2.05	1.71	1.85
Magnesium chloride	3.82	1.99	3.39
Insolubles	1.08	0.66	1.01
Undetermined	0.76	0.48	0.42

The above data shows that salt manufactured by the single irrigation method is generally of a poor quality. The brine is not sufficiently concentrated before admission to the crystallizers, and calcium sulphate and other salts find their way into the harvested salt. Also, as the bitterns are not properly drained, the salt is usually contaminated with magnesium salts which make it hygroscopic. The salt is scraped a number of times from the crystallizers; this damages the pans and mud contaminates the salt.

(b) *Multiple Irrigation Method.*—In this system the crystallizer is charged with concentrated brine 4"—5" deep and is periodically replenished to make up for evaporation. The crust of salt is allowed to grow into a layer varying in thickness from 3" to 9". Care is taken to see that at no stage the concentration of the brine in the crystallizers rises above 30° Be. The salt is harvested 3 to 4 times during the season. This system is more economical than the single irrigation system and the salt obtained is purer and cleaner.

A large number of salt works in Saurashtra and Kutch manufacture good quality salt by this process. Salt produced under this system has a percentage of 97.5 to 98.5 NaCl, impurities being calcium sulphate (1.14%) magnesium sulphate (.05%), magnesium chloride (.64%), insolubles (.08%) and undetermined (.46%).

CHAPTER V

INDIAN SALT INDUSTRY IN PRE-BRITISH DAYS

To have a clear idea of the development of salt industry under the British Government, it is essential to know the condition of the industry prior to and at the time of the British occupation. India has enormous quantities of salt, in the form of rock salt mines, salt lakes, salt efflorescence, brine springs and sea brine. Prior to the British occupation of the country salt was manufactured in various parts of India. It will be useful to make a survey of the conditions prevailing at that time province by province.

A.—NORTHERN INDIA

In pre-British days the Northern India territories, the North West Frontier Province (now in Pakistan), the Punjab (a portion also in Pakistan), Delhi, the United Provinces, Central Provinces, Ajmer, etc., got their salt either by manufacturing it by the lixiviation of salt earth or from the Salt Range mines and quarries or from Sambhar, Pachbadra, Bharatpur and Sultanpur salt works. The Mohammedan rulers raised revenue from salt by means of imposts on the privilege of manufacture and by transit duties on its transportation from the source of manufacture to the interior. These duties had frequently been farmed out. The Punjab mines (now in Pakistan) were in possession of the Sikh Rulers who also farmed out the mines to persons of eminence on contract. The farmer was under no restriction as regards time, place or price, and could sell salt wholesale or retail either at the mines or in distant markets. But owing to mining and transport difficulties, the Punjab rock salt did not go very far. Cis-Sutlej Punjab got its supply from Rajputana sources. The portions worked by the Sikhs still exist in Khewra and Warcha mines (now in Pakistan), but their work was unsystematic and unscientific. The output in those days was about six lakhs only. The Kohat quarries of Bahadar Khel, Jatta, Karak, Nari and Malgin (all in Pakistan now) were farmed out to Kohat chieftains.

Guma mine and Drang quarries in the Mandi State were worked by the Maharaja who got all the revenue. The salt was consumed in adjacent villages. The salt was rather impure containing only 60 to 70 per cent NaCl.

B.—RAJPUTANA AND CENTRAL INDIA

Extensive salt works existed in almost all States of Rajputana before the British occupation. The lease of Sambhar lake was taken by British Government in 1870. The leases of Pachbadra and Didwana were also taken. The Phalodi and Luni tracts were capable of producing large quantities of salt, but they were situated so far away in inaccessible places, the former far away in the desert and the latter at the head of the Rann of Kutch, that transport of the produce to markets was difficult and they gradually declined and were ultimately closed. The river Luni flows in a southwesterly direction to the Rann of Kutch and is for a long distance up from its mouth simply a vast natural deposit of salt. This natural salt was used by the people. Pokharan was another salt marsh 12 miles west of Phalodi. The Kachor Rewassa source in Jaipur manufactured a great amount of salt and was leased by Government in 1878. Salt was also manufactured in Nuh and Sultanpur works which were taken over by Government. Salt was also manufactured in other States, viz.

Udaipur, Alwar, Bikaner, Bharatpur, Bahawalpur (in Pakistan), Dholpur, Datia, Kishangarh, Rutlam, Indore, Jhallawar, Bhopal, Dewas, Jaora, Gwalior and Lewra. There were hundreds of salt producing villages. Agreements were entered into with the rulers of these states for suppression of salt manufacture and abolition of transit duties and taxes on salt on which duty had been levied by the British Government. Bharatpur alone is said to have been producing 44,000 tons annually when the works were closed by the Maharaja in 1876-77.

Before 1861 the saltpetre industry was unfettered. Lunias educed a lot of salt which was consumed by the poorer classes. Saltpetre was manufactured from nitrous efflorescence in the Punjab, U. P. and Bihar, and great quantities of salt were educed therefrom. In the Punjab earth salt was greatly manufactured in the Rajanpur sub-division of Dera Ghazi Khan district under contract system.

Salt was formerly prepared in Berar to a considerable extent, the sources of supply being drawn from the Lonar lake and the numerous brine wells of Purna in Akola.

C.—SIND

Sind (now in Pakistan) has extensive natural salt deposits which have been worked from times immemorial. The salt deposits have been mentioned in all the records since the British occupation. Mr. John McLeod Collector of Customs, Karachi, in his "Memorandum on the Pearl Banks, etc. and the salt beds of Sind" 1847, speaks of the deposits of Thar and Parkar and in the Rann of Kutch. He states, "the salt used in Kurachee is brought from the direction of Sonmeeanee, where it is found in deposit in beds of small size. It is found in the Mulleer river, and is met with along the entire coast, in greater or less quantity; in the interior of the country it is produced by parties who gain their living by its manufacture which is as follows; patches of salt earth are found scattered over the entire surface of the country; this salt soil is saturated with water, and the drainage is exposed in shallow vessels to the rays of the sun".

Captain Stanley Raikes, a Magistrate of the Thar and Parkar Districts in his Memoir on these Districts (1856) wrote that a considerable revenue was derived by the Zamindar of Veerawow from a salt lake situated closed to his village. He also mentioned that during 1845-46 in 10 months 60,928 maunds of salt were exported from this Mokye Salt Lake. Besides Mokye there were many other *Dhands* or salt lakes. Also there were numerous natural deposits of salt along the coast between Karachi and the Rann and in the desert to the north of the Rann. The lakes are situated in Jhils in the desert. These Jhils are filled with water during rains and on drying up leave a deposit of spontaneous salt which is covered over by a hard layer of sand. The surface is broken with a pick axe, about 9" below the surface brine appears and a few inches deeper are found solid masses of pure salt steeped in 25° Be. brine. This salt was collected and used by the people. Salt was also manufactured near Karachi at the head of a creek. Besides, 'Lunaris' or salt makers used to make large quantities of salt by lixiviation from salt earth especially in Upper Sind near Jacobabad. Some ealt works also existed at Mamul near the Jacobabad frontier.

D.—ASSAM

Formerly salt was manufactured in Assam from brine wells. For example, the springs of Borhat and Sadiya were in 1809 said to have yielded

1,00,000 maunds. In Cachar, Manipur and in some hill tracts isolated localities are even to the present day famous because of their salt wells. In olden days the hill tribes in these localities used to boil down the brine to get salt.

E.—BENGAL, BIHAR AND ORISSA

In pre-British days local manufacture of salt by boiling brine went on along the coast, licence fees being levied on manufacture and duties imposed on transport. Patches of saline soil where small-scale manufacture of salt is possible exist even now. These tracts are, however, scattered and the local people manufactured salt wherever they could. The climate of Bengal is very humid and unsuited to salt manufacture by solar evaporation. Solar manufacture does not appear to have been resorted to in pre-British days, but salt was manufactured by artificial heat. The local manufacturers were called "Mulanghis". In 1835-36. 44,00,000 maunds of locally made salt were sold at auction sales.

Salt was largely manufactured on parts of the sea board of Bengal including the present province of Orissa. 'Panga' salt was educed by boiling the brine obtained by the lixiviation of saline earth. This method was practised in numerous places on the coast of Orissa but mostly in Balasore and Cuttack districts. Manufacture of Karkatch salt—salt obtained by evaporation of brine by solar heat—was going on near Chilka lake south of Bihar. It is said that forty thousand men were interested in earth salt industry in Bengal, Bihar and Orissa at the time of the British occupation. In 1835-36 private individuals manufactured salt in Bihar, but the salt had to be sold to Government. In 1847 the manufacture of salt by the public under a system of excise was permitted. Under this system salt was manufactured to a great extent and was sufficient to meet the requirements of the province. The local industry was more or less protected by bad communications. The opening of the East-Coast Railway facilitated the import of cheaper Madras and foreign salts which proved fatal to it. A large quantity of earth salt was also manufactured, especially in Bihar. Salt was educed in the process of manufacture of saltpetre especially in the Bhagalpur district in Bihar.

F.—MADRAS

Salt earth is available in Madras in saline tracts from which earth salt is manufactured; salt also forms spontaneously in swamps. In olden days salt was manufactured by solar evaporation as well as by boiling. Spontaneous salt was extensively used for human consumption and earth salt for curing fish. Edible salt was also educed in the manufacture of saltpetre which for many years was carried on free from any restraint or regulations. This salt was consumed by the poorer classes. The Government salt monopoly was created in 1805. In Mysore earth salt manufacture was a recognized industry which went on for ages.

G.—BOMBAY

Salt was manufactured from sub-soil brine at Kharaghoda on the border of the lesser Rann of Kutch, Gujarat, Kathiawar, Dharangadhra and other States had numerous salt works. Sea salt was also manufactured, but the methods were rather crude. Even now salt manufacture in Bombay is mostly a private enterprise carried on under the excise system. Bombay manufacturers are intelligent and resourceful and have developed these traits through long experience. All along the coast in the Rann of Kutch salt

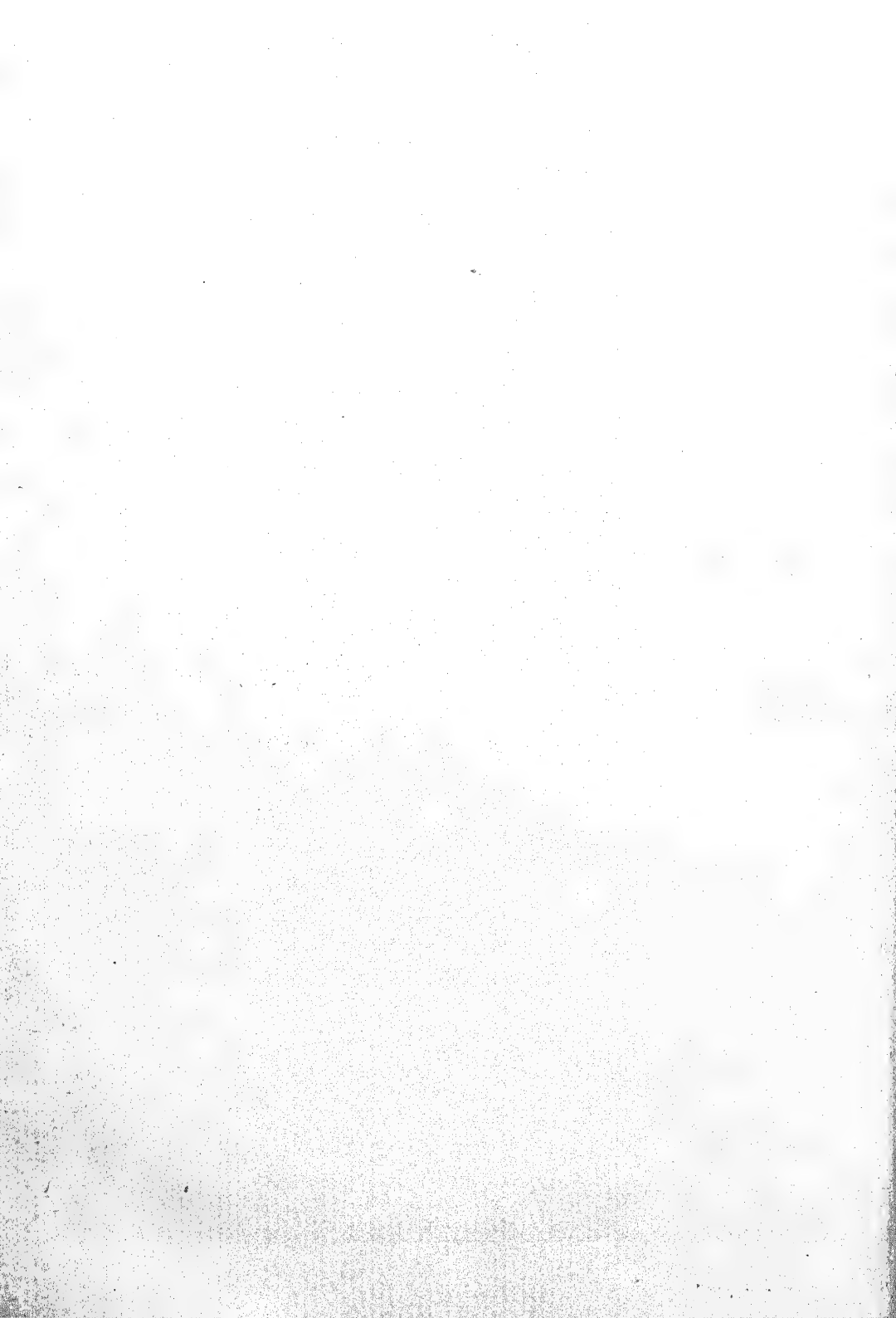
deposits form and the industry flourished as a cottage industry. A great quantity of salt also forms in the Rann. There were numerous deposits at some distance from the Rann. Even now the manufacture of salt in Kathiawar States is permitted under certain conditions. There were salt works in Daman and Goa. Salt was also manufactured in Okhamondal in Baroda and in most of the Indian States such as Cambay, Janjira, Savantvadi, Phaltan, Patri, Jhinjivada, Radhanpur, etc.; the works were closed and adequate compensation amounting to about Rupees one lakh per annum is paid to the Chiefs of the States by Government.

H.—BURMA

Salt manufacture is a cottage industry in Burma (which was a part of India upto 1937) and has been practised for ages. In olden days salt was obtained by the combined process of solar evaporation and boiling. Boiling was done in earthen pots or iron cauldrons. The salt boiler being conservative, the same method persists up to the present day. The Burmese have a motto which means "When all fails, cook salt". This shows that the manufacture of salt by boiling has been the resort of the poorest of the poor. According to Mr. Plowden's report submitted to the Government of India in 1856 salt was manufactured and sold subject to an excise duty levied in the shape of a licence.

In Upper Burma salt manufacture was more or less a hereditary occupation. Even now it is a cottage industry generally carried on by women and is subsidiary to agriculture. Brine was taken from wells or natural efflorescence was used. Burma has 1,200 miles of coast line and numerous salt deposits form in swamps, lagoons and creeks. Thus local manufacture went on at numerous places scattered all over the country. The industry would have died out but for low assessment rates; the rates of duty levied as composition fee have been much lower than duty on imported salt.

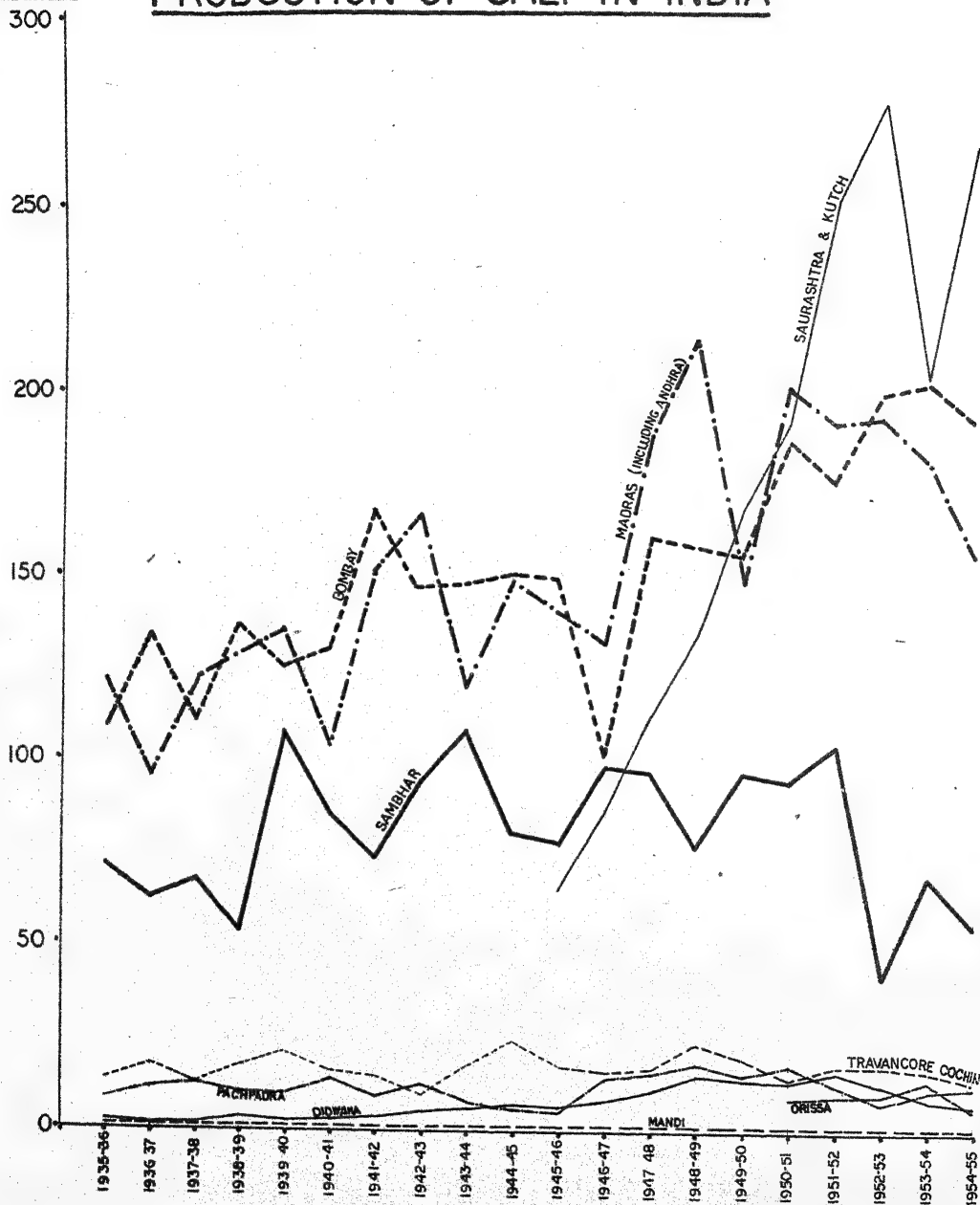
It will be clear from the foregoing that the salt industry prior to and at the time of the British occupation was unorganised. People geographically well situated as regards salt works or sources got their salt much cheaper than those who were far away. In general the methods were primitive and unscientific and the cost of production was high. The British Government adopted a policy of equalization of duty and price throughout India, resulting in concentration of manufacture at important sources, the introduction of up-to-date scientific methods and low cost of production. The output from many sources now is at least six or seven times the amount they produced when the British Government took them over.



SALT INDUSTRY
IN
VARIOUS STATES OF INDIA

Lakh Mds.

PRODUCTION OF SALT IN INDIA



CHAPTER VI

BENGAL SALT SOURCES

A.—HISTORICAL.

(i) *Pre-Muslim.*—From available information on the salt industry of India, it appears that till the early years of the 19th century, Bengal had not to depend on foreign sources for meeting her domestic requirements. People of coastal districts manufactured by their traditional process at least the quantity they required for domestic consumption every year. Those having trading relations with the inland-area used, however, to manufacture much more than their own requirements, but always under some sort of restraints imposed by the Government for revenue purposes. In the deltaic area of the Sunderbans there are canals and *khals* through which sea water floods the area during flow tides and recedes during the ebb tides. The banks as a result become saturated with brine and dry up in hot weather producing efflorescence of salt on them. These saliniferous areas had been utilised from time immemorial as a source of salt by the people. The process of manufacture was simple and consisted of lixiviating the scrapings of saline earth from these saliniferous areas and filtering the same through grass or straw. The filtered brine was then boiled in small earthen pots with fuel available from the adjoining jungles. Salt thus produced was known as 'panga' salt.

(ii) *During Muslim period and early British Rule.*—During the Muslim period manufacture of salt used to be considered as a privilege for which the manufacturers, then known as "Molungees", had to pay duty to the Government. Manufacturers were not however the traders. The trade was in the hands of a few monopolists known as 'Fakher-ul-Tejar' or 'Malik-ul-Tejar'. From Hunter's statistical account of Midnapore, it appears that salt was sold to the public at an average price of Rs.2. per md.

After the East India Company had taken possession of the district in the neighbourhood of Calcutta they imposed a salt tax in the double form of ground rent for the *Khalaries* (salt works) and transit duty; but about the year 1762 these were consolidated into a single duty of Rs. 30 upon every *Khalari*, the estimated produce of each *Khalari* being from 250 maunds to 300 maunds of salt. To this duty was subsequently added a further tax of Rs. 10 on every 100 maunds of salt manufactured. The quantity of salt having this duty annually was about 25,00,000 maunds. Price paid to Molungees in 1762 by authority of the Government was Rs. 40 per 100 maunds of 82 *sicca* weight to the seer (*vide* Report of the Committee of Secrecy 1773, Bengal Consultations, 1762). The wholesale price in Calcutta between 1764-65 varied from 80 to 100 *sicca* rupees per 100 bazar maunds. In 1765 on the acquisition of the Diwani, Lord Clive formed an Exclusive Company known as the "Society of Trade" for carrying on inland trade in bettle-nut, tobacco and salt. This measure constituted a complete monopoly of trade in these three articles over this province and in the article of salt it also constituted in effect a monopoly of manufacture. This concern was started for the benefit of the senior European Servants who enjoyed its profits as a supplement to their salaries. This however, was disapproved by the Court of Directors who in a despatch dated 20th November, 1767 insisted that manufacture and trade in salt should be open to all Indian subjects on payment of such tax as would not raise the wholesale price of the article beyond 140 *sicca*

rupees per hundred maunds. Accordingly under the Regulation promulgated by the Bengal Government on the 7th October, 1768 the system of free manufacture and trade under an excise tax on salt was introduced. The only restrictions (to prevent monopoly) were that no one person should make more than 50,000 maunds and salt should be brought to one or the other of the two specified places, to be there assessed to duty which was fixed at 30 *sicca* rupees for every 100 maunds. Owing largely to the malversations of Clive's Exclusive Company which long after its authority to manufacture salt had ceased, on pretence of selling off its old stock interfered with the business of the honest private trader, the system proved very unfavourable to Government revenue which declined from £118,296 in 1766-67 to £45,024 in 1772-73. The Government of Warren Hastings, therefore, resolved in 1772 again to assume management of the manufacture of salt. Thus since the beginning of the East India Company's rule the manufacture of salt was considered as a privilege and taxed as such till the time of Lord Warren Hastings (1772-80). In 1780 the Government resolved, for revenue purposes, to assume the management of the manufacture of salt, by introducing in the beginning a farming system, and afterwards an agency system. Under the agency system the Government agents would advance money to the "Molungees", who in their turn would make arrangements with the salt boilers for a stipulated quantity of salt to be delivered to the Company's agent. Agencies worked at Hijli, Tamlook, Chittagong and 24-Parganas and by age old country process of manufacture at different places the cost of production varied from annas 8 to annas 14 and the sale price was Rs. 2 a maund. A complicated set of regulations was introduced. The salt works were leased for a number of years. Later the salt produced was left at the farmer's disposal. Ultimately Lord Hastings formed a scheme under which the salt producing tracts were divided into separate agencies over each of which a Civil Officer presided who himself was subject to the Comptroller, the Head of the Department. The salt would cost to Government As.-8, 12 and 14 per maund at different places but the same price for the retailers was fixed i.e. at Rs. 2 per maund, the amount of duty thus varied from Rs. 1/2 to Rs. 1/8 per maund. The net receipts rose and in 1784-85 they were £ 6,25,447. The agencies worked at Hijli, Tamlook, Chittagong and 24-Parganas. Later Lord Cornwallis introduced a system of salt sales by public auction.

Subsequent Changes.—The agency system continued to function till 1848 when the agencies had to be suspended due to the competition of foreign salt. In 1817, for the first time importation of foreign salt for private sale under heavy import duties was allowed. About this time the quantity of salt manufactured and sold in Bengal was of the order of 50 lakh maunds. By 1851-52 the import figure of foreign salt rose to 29·2 lakh maunds. The causes for this success of foreign salt are reported to have been its quality and cheapness. The Company's Government in Bengal about that time adopted some of the practical recommendations of the Select Committee appointed by the House of Commons in 1836 to investigate the questions of salt supply in British India. The Committee advocated a system of combined Customs and Excise and "considerable reduction of the duty under a system of free competition". As a result of the adoption of the policy by the Government, foreign salt was allowed to be imported subject to the same duty as indigenous salt.

Excise salt and foreign competition.—The Company's Government were not, however, allowed until 1854-55 to replace their 'Monopoly' and agency system by manufacture and sale of salt under an excise system. It is, however, noted that the concern of one gentleman, Mr. George Princep at Narayanpur

and Goordap secured in 1847, after repeated attempts, the benefit of the excise system. This concern manufactured salt according to the so-called English Process, *i.e.* by condensing brine by solar evaporation and boiling in large iron vessels. In 1853 when reduction of stock of salt to a dangerously low quantity was apprehended and there was temporary reduction of the supply of imported salt, the Company's Government in Bengal with the permission of the Government of India opened the 24-Parganas agency and reserved the western portion for the manufacture of salt on excise system as an experimental measure. In 1856, Mr. Plowden was appointed Commissioner by the Government of India at the instance of the Court of Directors to enquire into the practicability of carrying into effect any system under which the manufacture and sale of salt in India shall be absolutely free and subject only to such excise or other duties as may now from time to time be levied upon such salt so manufactured". Mr. Plowden pointed out the feasibility of gradual extension of the excise system throughout the saliniferous area and a reduction of duty "at one leap" to Rs. 2 per maund. But in December, 1859 after the Sepoy Mutiny, the duty had to be increased to Rs. 3 and to Rs. 3/4. Immediate effect could not be given to Mr. Plowden's recommendation. The result was that the local industry gradually lost ground to imported salt. In 1862 the quantity imported was 7 lakh maunds. Several salt agencies were also abolished during that year.

In spite of systematic reduction of duty the position of Bengal salt began to deteriorate as will be evidenced from the following figures taken from Watt's Dictionary of Economic Products:—

Sources of Supply	1877-78	1878-79	1879-80
	Mds.	Mds.	Mds.
Foreign imports into Bengal . . .	90,68,649	91,81,775	89,40,088
Imports from Bombay and Madras . . .	5,54,965	4,99,679	5,30,104
Excise salt (Bengal) . . .	1,82,860	1,28,835	79,082

(iii) *During British period.*—By 1898 manufacture of salt in Bengal on a competitive basis seemed absolutely hopeless, and therefore, in the same year local manufacture of salt was altogether prohibited.

Attempts at manufacture during the first World war (1914—18).—During the first World war attempts were made on the Contai Sea Board by Messrs. Andrew Yule and Co., to manufacture salt on an experimental basis, but they had to drop their scheme, as costs of production and transport were so high that the venture was not an economic proposition.

Attempts at manufacture from 1931—39.—Since then private enterprise in salt making was not evident until 1931 when the Salt Industry Committee of the Indian Legislative Assembly, on examining the findings of the Salt Survey Committee of 1930, recommended that from the 18th March, 1931 an additional duty of four and a half annas per maund should be levied on foreign salt, the object of the levy being to utilise the proceeds *inter*

alia, for investigation of the possibilities of development of sources of supply in India, for example in Bengal, Bihar and Orissa, and generally on the east coast. One-eighth of the total proceeds of the additional duty was distributed amongst the provinces, Bengal's share in 1937-38 was Rs.16·8 lakhs. The effect of this duty would be evident from the fact that while in 1930-31 of the total quantity of salt imported into Bengal, 65·26 per cent. was foreign, by 1936-37 this figure came down to 8·25 per cent. So by this period 91·75 per cent. of the total imports of salt into Bengal was from Indian sources and from Aden, the share of the latter being 48·13 per cent. The additional duty was subsequently abolished on the 1st May, 1938 in India. In Burma, however, where salt is manufactured from estuary brine by boiling, the duty remained as previously levied.

Recent attempts (1940—55).—About this time attempts were made to manufacture salt in different areas and several factories were set up. The names of the factories and their production for the year 1940-41 are given below:—

Name of Factories.	Quantity of salt produced annually (mds.)
1. The Premier Salt Manufacturing Co., Purusatampur, Midnapore	3,240
2. The Bengal Salt Company, Dadanpatra, Midnapore	9,819
3. The Pioneer Salt Manufacturing Co., Sisirganj, 24-Parganas	526
4. The Indian Salt Manufacturing Co., Sudhirbanj, 24-Parganas	22
5. The National Salt Manufacturing Co., Maipith, 24-Parganas	1,090
6. The Premier Salt Manufacturing Co., Maipith, 24-Parganas	1,752
7. The Lokamanya Salt Works, Mausani, 24-Parganas	2,323
8. The Chittagong Trading Union Ltd., Fulchari, Chittagong	3,734
Total	22,506

It will be seen that production of the Bengal Salt Factories was only 22,500 maunds and was insignificant as compared to the total requirements. Later the question was examined by the Salt Industry Enquiry Sub-Committee appointed by the Bengal Industrial Survey Committee who submitted their report to the Bengal Government in 1944. A summary of this Sub-Committee's recommendation and the steps taken are given under the next heading.

B.—DIFFERENT COMMITTEES AND THEIR FINDINGS IN REGARD TO THE SALT MANUFACTURE IN BENGAL

Limitations of past enquiries.—Although Salt industry in Bengal has a long and memorable history behind it, as indicated in the foregoing paras, there was much mistaken information and belief about its possibilities in this province. The result has undoubtedly been quite unfortunate, for while provinces like Madras and Bombay have accomplished large-scale expansion of the industry and have stabilized its position on the basis of competitive

efficiency, Bengal's industry is still groping through the experimental stage. The inadequate progress of the industry is admittedly the result of a long series of pessimistic views regarding the possibilities of salt industry in this province. In recent times fresh enquiries have revealed that the earlier views on the situation were erroneous in some essential details with the consequence that a number of private concerns have already come into existence for the manufacture of salt while views of experts as well as Government departments have also undergone some change. Since the entire range of possibilities in Bengal has yet to be fully assessed, it is necessary to refer to the past enquiries and findings on the situation in order that the earlier investigations may form a fitting background of the real potentialities of Bengal to produce salt.

(A) *The Taxation Enquiry Committee's Report*—The first official enquiry into the possibilities of salt manufacture in India was, of course, the enquiry held by the Indian Tariff Board in 1930, but the first reference to the desirability of making India self-sufficient in respect of salt supply had been made in the report of the Taxation Enquiry Committee in 1926. The Committee reported that if India could be made self-sufficient by the "granting of a purely temporary advantage to the local manufacturer whether by way of a rebate of duty or of a differential duty on import or both", it would be a desirable end to achieve. They also recommended that an enquiry should be made into this matter by the Tariff Board. These recommendations of the Taxation Enquiry Committee were examined by the Central Board of Revenue with the help of its expert officers and their conclusions were as follows:—

- (a) The problem of making the mainland of India (as distinguished from Burma) self-supporting in the matter of salt supply resolves into that of capturing for Indian salt the market for fine white crushed salt in Bengal since no attempt could reasonably be made to compel the consumer in Bengal to like the ordinary Madras and Bombay salt.
- (b) The cost of transporting salt to Bengal from those places in India at which salt suitable for that market could be produced, and the extent to which such transport could be made available were factors of the greatest importance.
- (c) The probable limitations upon the output of sources in India which could produce the required quality of salt were such that in the evidence available, a reasonable probability that India could be made self-supporting in this respect could not be regarded as established.

The Central Board of Revenue thus negated any suggestions that India could be made self-sufficient in the matter of salt supply consuming white crushed salt.

(B) *Tariff Board Enquiry*.—But on account of emphatic reference in the deliberations of the Indian Legislative Assembly regarding the possibilities of salt industry in India and after subsequent re-examination of the situation by the Central Board of Revenue, this attitude of the Government of India changed and in 1929, the Tariff Board on Salt Industry was appointed with the following terms of reference:—

"The Tariff Board will accordingly be asked to report whether, having regard to relevant considerations, it is desirable in the national interest that steps should be taken to encourage the production of salt in India suitable for consumption in those markets which are at present largely

supplied from abroad and if so, what measures they recommend. The Board should take into account the relations between the Government of India and Aden and the conditions of the existing salt industry in the latter place and should make such special recommendations, if any, affecting the treatment of salt produced there as may seem to them to be appropriate. They should also note that it is already the settled policy of the Government of India to allow salt produced in Indian States and transported to Bengal or Burma by sea, admission to the markets in those areas, subject to reasonable safeguards to secure that the revenue accrues to the Government of India and that there is no illicit removal *en route*." The procedure of enquiry adopted by the Tariff Board was not aimed at a detailed enquiry into the possibilities of salt manufacture in all the provinces but was based on the available data and information. As such the enquiry instituted by the Board suffered from limitations. The main conclusions of the Tariff Board which were necessarily influenced by the limitations of their enquiry were as follows:—

- (i) That fine white salt suitable for replacing foreign imports in the Bengal market can be produced in India in sufficient quantities at a reasonable price.
- (ii) That Aden, Karachi and Okha stand on the same footing as these sources are to depend on shipping for sending salt to Bengal.
- (iii) That the greatest public advantage would be derived if the Northern India sources, viz., Khewra, Sambhar and Pachbadra could be developed for supplying rail borne instead of sea-borne salt to Bengal as it would be a guarantee against shortage at war time and it also will mean additional traffic for railways.
- (iv) That in developing the inland sources, the main desideratum should be stabilization of prices at a fair level in relation to the cost of production and that Rs. 66 per 100 maunds ex-ship at Calcutta would be a fair price in comparison with the average prices in the past.
- (v) That the potentialities of all the Indian sources should be thoroughly enquired into.

(C) *The Salt Survey Committee, 1930, and the Salt Industry Committee of the Indian Legislative Assembly.*—The report of the Tariff Board submitted in 1930 was considered by the Indian Government and in accordance with the recommendations of the Board the Salt Survey Committee was appointed in 1930 to report on the possibilities of the development of all the existing salt sources in India. The enquiry instituted by this Committee covered those sources only where salt was at the time manufactured by the solar evaporation method. Accordingly Bengal was left out of the scope of the enquiry altogether. The Committee submitted their report in 1931 which, along with the report of the Tariff Board, was considered by the Salt Industry Committee of the Indian Legislative Assembly. As a result of examination of these reports, the Assembly Committee recommended the levy of an additional duty of annas 4 pies 6 per maund (over and above the existing duty of Rs.1-9-0 per maund) on foreign salt imported into India. The report further recommended:—

"The proceeds of the duty which at annas 4 per maund would amount to about Rs.34 lakhs be earmarked for the following objects:—

- (1) The development of certain northern India sources in the manner recommended by the Salt Survey Committee (e.g., increase of production at Khewra, geological survey at Pachbadra, etc.

- (2) The investigation of the possibility of the development of other sources of supply in India, for example, in Bengal, Bihar and Orissa and generally on the East Coast, including possibly actual experiments in suitable methods of manufacture.
- (3) Any further measures that might be found necessary in the light of experience to secure the stabilisation of prices, *e.g.*, the establishment of a Marketing Board and the provision of working capital and reserves for such Board. Subject to the above consideration should be given to the distribution of any balance between those provinces that consume imported salt and would, therefore, be bearing the burden imposed by the extra duty."

(D) *Report by Mr. Pitt (1932).*—In accordance with the suggestion of the Assembly Committee that an investigation into the possibilities of salt production in Bengal, Bihar and Orissa should be held, Mr. C. H. Pitt, General Manager, Salt Range Division, Khewra (Punjab), was appointed to undertake the enquiry in 1932. Accordingly Mr. Pitt visited the following areas in Bengal:—

- (a) The Western Sunderbans area including Saugor Island, Fraserganj and Lothian Island.
- (b) The coast area of the Midnapore district near Contai.
- (c) The Salt lakes near Mohishbathan.

His main conclusions regarding the possibilities of salt manufacture in Bengal areas were as follows:—

- (i) The meteorological data for the Calcutta and Balasore coasts compare very unfavourably with those of Bombay and the north-western coast sources. The humidity is higher, the temperature lower, and the winter rainfall very much heavier. Bombay has a rainfall in the manufacturing season of 1.19" only whereas the figure for the Bengal and Balasore coasts is about 5". It is unlikely that a working season of more than four months could be obtained on the north-eastern coast.
- (ii) The meteorological data appear to rule out immediately the possibility of salt manufacture by solar evaporation only in these areas.
- (iii) The Bengal and Orissa markets are close to the areas where it is considered salt might be manufactured. It cannot be said at once that manufacture by any process on a commercial scale is impossible. The evidence is not such as to justify optimism and is barely sufficient to justify investigations on an experimental scale. But experiments may prove that manufacture at an economic rate to supply local demand is feasible.
- (iv) Manufacture by vacuum evaporation requires complicated and costly plant and skilled labour. It also requires an uninterrupted supply of concentrated brine which would at the best be obtainable for only four months of the year. Owing to the short working season, depreciation on the plant would be heavy, supervision would be costly and the probability of the plant's continuous working would be doubtful. So it seems unlikely that this system of manufacture would be successful.
- (v) One or more experimental factories might be established to test possibilities of manufacture by the old process combining solar and artificial evaporation.

- (vi) Efforts may be made to encourage manufacture of salt as a cottage industry, although there is no record to show that salt was ever manufactured on Bengal coasts on a cottage basis. Since salt is made locally for home consumption under the Government of India concession (as provided under Gandhi-Irwin Pact) what might form the nucleus of a market for salt produced by the cottage industry method already exists. Warehouses might be erected for collection of salt made by villagers living on the coast to store any salt manufactured in excess of that required for purely local consumption before transport inland. Such warehouses might be erected by the merchants interested.

Limitations of Mr. Pitt's Report.—It may be sufficient to state here that Mr. Pitt's investigations did not cover the entire coastal areas of Bengal, but extended only up to the Lothian Island, which is practically at the estuary of the Hooghly. Mr. Pitt, therefore, had no opportunity of surveying the possibilities of the vast areas of Sunderbans, the salinity of water available there and also the position with regard to fuel supply. Further east, the coastal areas in Bakergunge, Noakhali and Chittagong also remained outside the pale of Mr. Pitt's enquiry. Thus his conclusion necessarily suffered from inadequate information and practical tests.

Enquiries held under the auspices of Bengal Government.—After the publication of Mr. Pitt's Report, the Department of Industries, Bengal, instituted an independent enquiry into the possibilities of salt manufacture as a cottage industry. The occasion was to hold an enquiry into the processes followed by the Premier Salt Manufacturing Company, Ltd., which had been established in 1933. The Industrial Chemist of the Department undertook the enquiry and his report was considered by the Board of Industries, Bengal, constituted under the Bengal State Aid to Industries Act. His conclusions were (i) that there was no possibility of salt manufacture on comprehensive lines as a cottage industry by lixiviation in Bengal, and (ii) that the method of manufacture suitable for Bengal would be a combination of Karachi and Burma methods, and would involve the use of extensive trenches for the extraction of pit brine and also the use of sea-water from time to time as might be found expedient. His proposal was that no fuel should be used and anticipated that salt would be deposited in sufficient quantities by solar heat alone. The Board of Industries on examination of the report by the Industrial Chemist passed a resolution to the effect (i) that an experiment on the methods suggested by the Industrial Chemist would be possible, and (ii) that the advice of a competent officer familiar with the conditions prevailing in Burma and on the Coromandal Coast should be obtained, as to whether an experiment on these and similar lines was justified. With reference to this resolution, the Government of Bengal approached the Government of India with the request that they might secure the services of two experts, one from Burma and the other from Sind for the purpose of carrying out the necessary investigations in Bengal. Accordingly in 1934 the two officers came to Bengal on deputation and while the officer from Burma undertook an investigation into the possibilities of salt manufacture on the sea boards of Contai and Cox's Bazar sub-divisions, the officer from Sind instituted the enquiry in the Contai sub-division of Midnapore district only.

(B) *Reports by the Burma Expert and the Sind Expert.*—The reports furnished by the two experts after the completion of their enquiries were never published but were considered as official documents. The Burma

Expert's main conclusion was that there were good prospects for the manufacture of salt by the Burma method on a commercial scale, particularly in the Cox's Bazar sub-division of Chittagong district, while the conclusion of the Sind Expert was that the pit brine system of manufacture was not at all suitable on a commercial scale in Bengal. The positive advantages accruing from these enquiries were that while a wealth of information and data was collected and considered in the matter of developing salt industry in Bengal, public ideas about the possibilities of the industry slowly underwent a change and private enterprise and capital began to be drawn towards the industry, although on a limited scale.

(F) *Report by Mukherjee and Rao (1937).*—The next enquiry into the possibilities of salt manufacture in Bengal was that undertaken in 1937 by Shri D. N. Mukherjee, Superintendent of Excise and Salt, Calcutta and Shri V. S. Rao, I.F.S., Deputy Conservator of Forests, Khulna, under the direction of the Forests and Excise Department, Government of Bengal. Although their enquiry related primarily to the Sunderbans, their main conclusions had a bearing on the province as a whole, which were as follows:—

- “(i) The tract lying between the rivers Saptamukhi and Harinbhanga is the most saline part of the Sunderbans and the soil appears well suited for the manufacture of salt.
- (ii) The density of the sea brine tested along the steamer route from Saptamukhi to Terobanki Khal up to its junction with Harinbhanga was found to vary from 2.2° to 2.6° Beaume which is quite suitable for salt manufacture. The density gradually declines on proceeding towards the east. The reason is that unlike the eastern rivers, the rivers in the western Sunderbans practically get no flow from the Ganges or from any of its tributaries.
- (iii) The available quantity of fuel from the Sunderbans after meeting demand for domestic consumption has been estimated to be about 47 lakhs of maunds per annum, without disturbing the forest working plan in any way. Out of this Sundri fuel constitutes $37\frac{1}{2}$ lakhs of maunds.
- (iv) With the above 47 lakhs of maunds of fuel it will be possible to manufacture 37 lakhs of maunds of salt, which is 46 per cent. of the consumption of Bengal proper. Bengal imports 140 lakhs of maunds of salt every year and consumes 80 lakhs of maunds, the remaining 60 lakhs being exported to Assam, Bihar and a portion to the United Provinces.
- (v) We have re-examined the meteorological data and we are doubtful whether the solar process will be a commercial success in Bengal, unless a cheap and easy contrivance can be devised for protecting the crystallising beds from the sudden rains. There is no harm if prospective manufacturers carry on experiments to make it a success, as it has never been tried in Bengal before.
- (vi) We do not, however, agree with Mr. Pitt that there is no likelihood of the success of salt manufacture in Bengal by any other method. The meteorological data show that Bengal has a better prospect of salt manufactured by the Burma process than Burma itself.
- (vii) We also do not agree with Mr. Pitt that the salinity of sea brine on the Bengal coast never exceeds 1.5° Beaume. Mr. Pitt did not visit the Sunderbans to the east of Lothian Island and had therefore no opportunity to study the salinity in the area which we have visited.”

(G) *Report of the Salt Industry Enquiry Sub-Committee (appointed by the Bengal Industrial Survey Committee) (1943).*—The Mukherjee-Rao Committee report recommended two specific measures, namely:—

- (i) an experimental factory to be started in the Sunderbans for the manufacture of salt from sea water by the application of artificial heat as is done in Burma; and
- (ii) the appointment of an Expert from Burma.

Accordingly the Bengal Cabinet sanctioned on the 17th November, 1938 a scheme for an experimental salt factory costing Rs.10,000 non-recurring and Rs. 2,000 recurring plus the pay of an Expert to be imported from Burma. The Director of Industries had not been consulted before the scheme was proposed and sanctioned. When he was asked to implement it, he found that the scheme proposed was not on up-to-date lines and that results of experiments on such a scale would not afford the necessary guidance in technical matters to the salt concerns organised on a joint stock basis in Bengal for work on a much better scale. Accordingly he submitted an alternative scheme costing Rs. 62,000 non-recurring and Rs. 14,000 recurring. Thereupon the scheme for an experimental factory as originally sanctioned was abandoned. The scheme put up by the Director of Industries was not, however, sanctioned by the then Finance Minister who suggested that other possible forms of assistance to the salt companies, such as financial help for a limited period, cost of training their experts, payment of subsidies, etc., should be examined. The Director of Industries was asked to put up suggestions in this respect. Accordingly he convened a conference of salt manufacturers in December, 1939 and the conference unanimously came to the decision that the greatest need of the salt companies was technical guidance as much time, labour and money had been spent by individual salt companies without commensurate benefit. In accordance with the resolution of the conference, the Director of Industries submitted in his letter No. 12479-G dated the 6th December, 1939, the following proposals:—

- (a) An expert should be appointed to render free advice to the salt companies so that they may improve their methods, to make a survey of the possible areas for manufacture of salt by the Burma method as well as by the Madras method or by a combined method that might be suitable for Bengal and to recommend the subsidisation of any salt factory;
- (b) A Central Salt Laboratory should be established in Bengal for carrying on research on different aspects of the industry;
- (c) A Salt Committee for Bengal on the lines of the Central Jute Committee should be established to look after the progress of the industry.

In March, 1941, on a reference from Government, Director of Industries outlined the conditions upon which financial assistance could be rendered. But emphasis was again laid on the urgency of the need for correct technical guidance particularly in view of the fact that the Central Board of Revenue had in the meantime drawn attention to the feasibility of adoption by the Bengal manufacturers of the method of salt manufacture by solar evaporation, while the other process, e.g. the application of artificial heat had so long been kept in view by the Government of Bengal. Thereupon the whole question of developing salt industry in Bengal was referred to the Bengal Industrial Survey Committee on the 13th June, 1941. This Committee appointed a sub-committee known as the Salt Industry Enquiry Sub-Committee. This Sub-Committee examined the whole question and while

submitting their report in 1945 when complete result of the warehousing experiment was not available, observed; "as there is a large economy in the production costs, provided (a) the salt boilers are supplied with wood or coal fuel at economical rates, and (b) their technique of production is simplified and economised, the economic potentiality of salt industry on a cottage basis may be improved up to a certain extent". They further indicated that in Sunderbans and Chittagong supply of fuel might be organised to the advantage of the salt boilers through an understanding and sympathetic policy on the part of the Forest Department.

The Sub-Committee on the basis of the facts and figures made available to them came to the conclusion that both Burma method and the solar evaporation method were suitable for Bengal, depending on the local conditions. In the Sunderbans due to availability of cheap fuel the former method was considered appropriate while in Contai solar method was considered more suitable, and in Chittagong both the methods might be tried. The Sub-Committee recommended a three-fold programme.

(i) Besides making all possible facilities available to cottage manufacturers working under the Gandhi-Irwin Pact, the small factories should be encouraged to increase output by affording them financial facilities, technical help as well as facilities for brine supplies to their sites in collaboration with the Department of Irrigation and Forest.

(ii) Conditions should be created so that private initiative may be attracted to start production on a large-scale factory basis. Government should also take steps to start one or more "Pioneer Salt Factories" which while ensuring a substantial part of Bengal's salt requirement will serve as a guidance to private enterprise.

(iii) Several ancillary industries may be started for the utilisation of bitterns and also of concentrated brine for producing alkalies which will economise the cost of production of salt besides solving to a great extent the problem of basic chemicals for many industries.

(H) *Salt Experts Committee and their recommendations.* (1950).—The Salt Experts Committee constituted by the Government of India in 1948 went into the question of development of salt industry in Bengal. The Government of West Bengal placed before the Committee a scheme for the future development of salt industry in (a) Contai Sea Board, and (b) Sunderbans. In Contai an area of 7,766 acres in 3 saline belts *viz.* Purushattampur, Deuli and Ramnagar having 2,350 acres, 4,216 acres and 1,200 acres respectively was selected and in Sunderbans they proposed to develop 1,500 acres. The expected yield from all these works, according to them, would be 74,60,300 maunds. The West Bengal Government proposed to give financial aid to the Factory already existing in Purushattampur which had shown, according to them, encouraging results; while in Deuli and Ramnagar they had under contemplation the setting up of one or two industrial corporations with share capital from Government of West Bengal, Government of India and private parties. Even if the Government of India was not inclined to participate the West Bengal Government, it was stated, would go ahead with their proposal. The Salt Experts Committee submitted their report in 1950 and their main recommendations were as follows:—

- (i) As the meteorological and other technical data available at Contai were not adequate, the Government of India should appoint an Investigation Officer at the Salt Works of the Bengal Salt Co. Ltd., to collect the same.

- (ii) Before any large scale manufacture is undertaken at Contai, the question of transport both by canal as well as by rail routes should be examined.
- (iii) Salt can be produced on a larger scale in West Bengal only by the solar evaporation.
- (iv) The Government of India and the Government of West Bengal should set up a large Government factory at Contai and also assist the private manufacturers financially in order to encourage the development of the salt industry.

(I) *Report of the French Experts.*—Meanwhile, acting on the lines of the recommendation given in the interim report of the Committee, a full-fledged meteorological station was established in 1950 at Contai by the Government of India. Further, the Government of West Bengal, towards the end of 1949 brought two Salt Experts from Saline De Graud, the biggest Solar Salt Works in France. The party consisted of Mr. Joseph Rochet, Mr. Bernard de Crest and Mr. Bernard Hennerick of the “Compagnie Saliniere de la Camargue (SALICAN)”, France. They were asked to study on the spot the possibilities of building up a salt factory at Contai and to estimate the cost and the probable economical running of such a salt factory.

They stayed in India for over 3 months during which the prospective sites were visited and the problems studied. They submitted an interim report in 1950 pending the final report to be submitted on receipt from the Government of Bengal certain meteorological and other data. Accordingly, they sent their final report in 1951 and recommended the starting of a big factory on Contai Sea Board under solar evaporation system at an estimated cost of Rs.3.74 crores which included the capital costs of transport arrangements for bringing salt up to Calcutta by boat. Their recommendations in a nutshell are given below:—

Selection of the site, Geographical situation, Meteorological Data, etc.

The Experts thought that about 10,000 acres in one single piece were indispensable for the economic running of a good factory. They suggested location of the factory along the area of 30 miles from the border between Orissa and West Bengal towards south-west-north-east up to the Rasulpur river. About 9,000 acres with extension possibilities is available there. The area is lying between Digba and Rasulpur, between the dike and the sea.

The average salinity of the sea-water is 2.5° Be. and the soil is impervious. They thought that the active season can start early in November and terminate in May. On an average a factory will get 170 mm. of rainfall. The Experts observed:—

“dividing along the time of these rainfalls together with the regular succession of the wet and dry periods, constitute for better meteorological conditions than at Salin de Graud, the great French Salt Factory area.” As regards evaporation the Experts concluded that the Bengal coasts are more favourable for solar evaporation than the Salin de Graud.

Requirements of electrical power, maintenance of machinery, pumping, salt collection, etc.

The Experts calculated that the electric power required would be about 1400 kilowatts. They suggested establishment of a Power House outside the dike near the Pichabani river. They thought that the skilled

workers will be required for every line both for driving and repairs. According to them the run-off of the pumps will be very important, about 2,000,000 M3 per day and will have to be carried out by a number of pumping stations. They were not in favour of mechanization of salt collection. They, however, suggested mechanisation of transport of salt from the collection centre to the heap. It was suggested that the heaps should be covered with rice straw to avoid dissolving of salt by rain.

Communication with Calcutta being indispensable, it was suggested that the road between Contai Road and Contai should be repaired. A bridge should be built over the Orissa canal; Howrah-Kota-Panskura-Tamluk-Contai route should be utilised by providing ferries on the rivers and channels in between. They suggested taking of Contai salt to Calcutta market irrespective of its ultimate destination.

As regards tansporting of salt to Calcutta, they suggested the following two ways:—

- (a) to link up the factory with Kukrahati, facing Diamond Harbour, by an serial rope-way, and then to send the salt thus brought by boats up to Calcutta port, and
- (b) to carry, without any re-loading, the salt from the factory to Calcutta by boats plying along the Pichabani linked with the Orissa canal, then Hijili Tidal canal and lastly with the Hooghly river.

They suggested the second solution as economic one which would cost far less than the salt from abroad or even from the nearest Indian port

Administrative structure

As regards the administrative structure, they suggested that the management should consist of a Board of Directors with headquarters at Calcutta, a Salt Factory Manager and a Calcutta Office Manager. The former being in charge of the factory and the latter of transport, grinding, accounts, sales, etc., both having under them necessary staff.

Finances

As regards Finances, they suggested an investment of Rs. 4,85,86,000 spread over a period of five years. The Experts recommended to have a small share capital and raise money through debentures. They thought that every year 20% of the expenses should be obtained from share issue and 90% could be borrowed by floating loans. The construction of the plant required an issued capital of Rs.1 crore and loans up to a maximum of 3.92 crores spread over 5 years.

Conclusion

The Experts concluded: "The building up of a salt factory on the Bengal coast is not only altogether feasible, but that, due to the prices at present fetched in Calcutta, by salts of various origins, such an establishment would offer prospects of economical running that but a few industrial undertakings could visualize".

However, since there is over-production of salt in the country as a whole, a large quantity is being imported from the west coast and the scheme is very costly, it has been decided by the West Bengal Government to abandon the scheme.

C.—SYSTEM OF MANUFACTURE

(i) *Panga Salt*.—The indigenous system of production was rather crude. Salt was manufactured from saline earth in the coastal areas by the following process. The *modus operandi* varies only in certain details from region to region. The method then pursued was as follows:—

A circular pit is dug out at an elevation near the heap of salt earth. The bottom of this pit is pressed or smoothened in a manner that it becomes slightly slanting and two drains are cut cross-wise. At one end of these drains a bamboo pipe is attached below which a small well is made to receive brine water trickling down the pipe. On the bottom of the pit leaves of date palm or bamboo mats are spread out. Upon them salt earth is piled to a height of 6" to 8". Then pure water or saline water is poured upon the earth with care so that no hole is made below through which brine water may leak. The water dissolves salt contents and drops into the well through the drains and the pipe. The density of this water is usually 22° Be. at the early stages of filtering and gradually it decreases. This water is then carried into pitchers and boiled in iron pans to make salt. After the salt is taken out of pans it is tied up in a piece of cloth and placed under cold ashes. This process soaks up the water and renders the white salt which is then ready for consumption and for the market.

(ii) *Kurkutch Salt*.—Kurkutch salt was obtained by evaporation by solar heat of brine obtained from the sea or from back-waters or lagoons communicating with the sea. This method prevailed in the neighbourhood of Chilka lake then in Bengal but now in Orissa. Details of this method have been given in the chapter on Orissa.

Present factories

At present two salt factories *viz.* (i) The Bengal Salt Company and (ii) The Great Bengal Salt Company, are working in West Bengal. The former has a working and developed area of 600 acres with plans to bring another 300 acres under salt cultivation. The production of this factory at present is about 1½ lakh maunds per annum, but they expect to produce 3 lakh maunds per annum when their entire area is developed. Their cost of production at present is As. 8 per maund. The area occupied by the other factory is only 125 acres and their production is 27,000 maunds per annum.

D.—SOURCES OF SUPPLY

(i) *Up to 1947*.—As will be clear from the historical portion, up to 1863 Bengal manufactured its own salt. The industry was, however, crushed by imports of foreign salt and from 1863 onwards Bengal mostly depended on extraneous sources for its supplies. From 1863 to 1930 salt was mainly imported but after the passing of the Salt (Additional Import Duty) Act, 1931, supplies from Aden and Indian sources increased but declined from other countries, such as England, Germany, Spain, Roumania and Africa. The Bengalee no longer showed an exclusive taste for the Panga and fine variety. The coarsely crushed and crude salts, which were cheaper, were mainly responsible for a change in his taste, prices being the determining factor. Panga salt was no longer imported. Salt during these years was imported only from Germany (Hamburg), Aden and Indian sources (Bombay, Karachi, Okha, Porbandar, Tuticorin). Other places which formerly supplied large quantities, namely England, Spain, Port Said and the Red Sea Ports Mossowah and Assab sent very little quantities.

(ii) 1947—1955.—Imports from Germany and Aden also practically finished during this period. Salt is now supplied to the Bengal market from Saurashtra Ports, such as Jamnagar, Porbandar, Navalakhi, Bhavnagar, etc., and Tuticorin. During recent years the quantities coming to the Calcutta market have been about 17 Lakh maunds per annum.

Salt was imported all the year round. Liners from Hamburg carried salt to make up their cargo. Part cargoes from Indian ports were carried by the British India Steam Navigation Company's coastal vessels, while tramp steamers called in at Aden and the Western India Ports and transported large consignments of salt to Calcutta, re-loading, when empty, with coal or a cargo of jute in the season. While some of the Indian ports such as Karachi were affected by monsoonish conditions, Aden owing to her lack of rainfall, shipped salt cargoes to Bengal practically throughout the year to find invariably a ready market.

E.—KINDS OF SALT IMPORTED

The following are short descriptions of various kinds of salt imported:

(1) *German Salt*.—This is rock salt obtained from mines. It was imported after having been crushed at the mines. Its chief characteristic is its excessive dryness, and it has properties in retaining moisture, which renders it less liable to wastage due to climatic influences.

(2) *Aden Salt*.—This is manufactured from sea water by solar evaporation and was imported both in Kurkutch and Fine forms. Aden used to send more than half the salt imported into Bengal.

(3) *Indian Salts*.—

(a) *Bombay*—Manufactured by solar evaporation. Imported in Kurkutch or crystal forms. This salt originally had a very muddy appearance. There has been an improvement in the appearance in recent years.

(b) *Madras*—The term Madras salt includes salt imported from Tuticorin which generally arrives in Kurkutch or crystal form.

(c) *Saurashtra Salt*—This salt is also manufactured by solar evaporation, and is imported in crushed form. Importations are large and regular and find a ready market.

F.—IMPORT FIGURES

The imports in recent years have been as follows:—

Year	Lakhs of maunds.	Year	Lakhs of maunds.
1911-12	134.86	1916-17	95.27
1912-13	137.03	1917-18	83.79
1913-14	146.70	1918-19	100.19
1914-15	108.29	1919-20	108.38
1915-16	134.24	1920-21	156.06

Year		Lakhs of maunds	Year		Lakhs of maunds
1921-22	. . . .	116.50	1938-39	. . . .	131.1
1922-23	. . . .	132.59	1939-40	. . . .	157.3
1923-24	. . . .	103.16	1940-41	. . . .	118.1
1924-25	. . . .	151.73	1941-42	. . . .	109.6
1925-26	. . . .	136.92	1942-43	. . . .	68.0
1926-27	. . . .	132.20	1943-44	. . . .	65.1
1927-28	. . . .	145.24	1944-45	. . . .	117.0
1928-29	. . . .	150.37	1945-46	. . . .	90.71
1929-30	. . . .	162.46	1946-47	. . . .	151.9
1930-31	. . . .	173.92	1947-48	. . . .	138.9
1931-32	. . . .	135.09	1948-49	. . . .	146.6
1932-33	. . . .	156.25	1949-50	. . . .	165.5
1933-34	. . . .	123.28	1950-51	. . . .	156.9
1934-35	. . . .	140.05	1951-52	. . . .	136.9
1935-36	. . . .	153.58	1952-53	. . . .	125.8
1936-37	. . . .	144.07	1953-54	. . . .	114.7
1937-38	. . . .	144.3	1954-55	. . . .	125.4
			1955-56		133.2

G.—SYSTEM OF SALES

(i) *Old.*—In olden days the great bulk of the salt consumed in Bengal being sea-imported passed into consumption by payment of duty direct from ship board or from the bonded warehouses at Salkia (Howrah) and Chittagong and 8 private bonded warehouses in Bengal (1 at Narayanganj, 3 at Bhairab, 2 at Kamlaghat and 2 at Chandpur).

Inland Bonded Warehouses

The bonding system was one of the various facilities offered by Government for the distribution of salt with the object of reducing its price to the consumer. Private bonded houses were first established as long ago as 1836 at declared warehousing ports. In 1863 the Collector of Customs was authorised to license private bonding warehouses at places other than ports. Public warehouses for salt under Government control were established under Section 15 of the Sea Customs Act of 1878 at the ports of Calcutta and Chittagong. The private bonded warehouses were established under section 4 of the Inland Bonded Warehouses Act, 1896 at places other than warehousing ports. Up to the abolition of the duty (April, 1947) there were eight private bonded warehouses in the Presidency of Bengal, two at Chandpur in Tippera, one at Narayanganj and two at Kamlaghat in Dacca and three at Bhairab in Mymensingh. Four out of these eight were opened

in 1934-35. At each of these warehouses a Daroga and peons were stationed on behalf of Government, but at the cost of the bonder, to supervise the receipt and issue of salt. About three lakh maunds of salt were annually sent to these warehouses from shipboard and Salkia. The advantage to traders was obvious. By the postponement of the payment of duty till the salt was actually issued, a trader was able to conduct his business with much less capital than if he had to prepay the duty. The inland bonded warehouses were inspected by the district officers and officers of the Excise and Salt Department. When the duty on salt was abolished with effect from 1-4-1947, need for having the Inland bonded warehouses ceased to exist and these were, therefore, closed.

(ii) *Present.*—At present the imported salt goes direct to the importers for distribution in Bengal and despatch to North and South Bihar, Assam, Nepal, etc., but 10% of the imported quantity has to be kept compulsorily in the Golahs under the Salt (Reserve Stock) Order of 1950. This Order was promulgated in 1950 when the traders began to corner salt and created artificial scarcity. When such emergencies arise, salt is released from the reserve stock in the golahs to bring the market to normal.

H.—SELLING PRICES

The prices of foreign salt did not fluctuated greatly; during 1930-31 to 1938-39 they varied from Rs.210 per 100 maunds to Rs. 240 per hundred maunds. During the World war II (1939 to 1945) the prices shot up steeply and were as high as Rs. 750 per hundred maunds. During the last seven years (1947 to 1955) it is all Saurashtra and Tuticorin salt that is coming to the Calcutta market and the prices are more or less steady. If the average being Rs. 2251-per 100 mds.

Detailed information about prices has been given in the Chapter “Foreign Salts in India”.

Calcutta supplies several areas, such as, Assam, North Bihar, South Bihar, West Bengal, Manipur, Tripura, Nepal and Bhuttan. So the distribution problems are varied and many here.

I.—DISTRIBUTION

Calcutta is the largest salt importing port in the world and it supplies salt to the biggest deficit pocket in India comprising West Bengal, Assam, Bihar, part of Uttar Pradesh, Sikkim, Nepal, Bhutan, Tripura, Manipur and also East Pakistan. It supplied about 150 lakh maunds of salt during 1955-56, which is about 20 per cent. of total consumption of India. It was only by the middle of the last century that movement of salt from Calcutta into the interior by rail started. In 1855-56 a quantity of 9,797 maunds only passed by rail into the interior but the quantity showed a rapid increase having been 5,37,618 maunds in 1862-63. There was a rapid

increase in subsequent years in the despatch of rail-borne salt which soon replaced the movement by river and waterways. The movement of salt by road on motor vehicles is a more recent development.

Salt movement by railways which continued to increase was faced with serious problems during the years 1941 and onwards owing to the outbreak of the hostilities in the Far East. Although the World war came to an end in the year 1945, the problem of distribution of salt by railways was still acute owing to the demand for space being much in excess of its availability. The position became so acute that in 1947 some of the local governments were forced to enact Salt Control Orders to regulate the distribution and price of salt. There was, however, no attempt to regulate or rather evolve any planned system of distribution of this very essential commodity until the present Salt Department was ushered into existence in 1948. Up to 1939 salt was despatched to different areas from Calcutta by a limited number of traders. During the years of the World war II the movement of salt suffered the same difficulties as other civil commodities. The cessation of war brought into the picture a greatly increased number of traders and speculators who scrambled for railway space in order to earn substantial profits. The first Step taken by the Salt Department was to introduce a system of issue of stock certificates by which salt could move on priority basis. According to this system when a merchant applied for a stock certificate in a specified form giving place of storage of salt, railway stations of despatch and the destination, an Inspector of the Department was deputed to check the stock and to certify if sufficient stock was found and that the stock certificate may be issued. After this the Regional Officer issued the stock certificate which was sent to the railway authorities for allotment of wagons. Wagons could be allotted to such stock certificate holders and to none else. This system was initially adopted for preventing wastage of wagons. The introduction of the system of issuing stock certificates did not materially improve matters until after the middle of 1949. At that time there having been neither any organised department nor any list of *bona fide* traders, a system of 'first come first served' was adopted for the purpose of issuing these stock certificates. The Salt Department was receiving applications from all and was issuing stock certificates only to the first few applications received up to the number for which wagons were available. A very large number of applications much in excess of the number of wagons available on a day the number having gone up to 1,200 on a particular date—were received from various persons many of whom were never in the salt trade. Another very serious objection to the "first come first served" principle was that a small group of merchants were manipulating all the wagons by putting in applications under various names and titles. Taking all these into consideration, a system of enlisting *bona fide* salt traders in Calcutta to be known as "Registered Dealers" who alone would be entitled to apply for stock certificate for wagon allotments was introduced in the early part of 1949. Selection of such dealers was made by the Salt Controllers. In 1949 the number of such registered dealers was 67 which rose to 103 in 1951. The stock certificates are issued to them in such a way that wagons are allotted by the railway authorities in strict rotation, each getting the same number of wagons in a particular period. Besides these registered dealers there are nominees of several of the State Governments who despatch salt to the respective States as per quota allotted to each of them under the Zonal Scheme of distribution. The Department exercises control over movements by rail only. The zones fixed under the Zonal Scheme of distribution have been subjected to modifications from time to time. Until 1952 salt was distributed to Assam, West Bengal,

Bihar, Uttar Pradesh (part), Orissa (part), Manipur, Tripura, Sikkim, Bhutan, Nepal and East Pakistan from Calcutta. The Zonal allotment of the Calcutta zone is 1,21,85,000 maunds during 1955, which is distributed as follows:—

Name of the State	Maunds
Assam	19,00,000
North Bihar	13,00,000
South Bihar	32,00,000
West Bengal	50,00,000
Manipur	1,00,000
Tripura	1,10,000
Sikkim	20,000
Bhutan	5,000
Nepal	5,50,000

To ensure smooth working of the scheme the Regional Officer has to maintain close liaison with the Railway authorities and the Civil Supplies authorities of the different State Governments. He has been taken in as an *ex-officio* member of the Transport Advisory Board, Government of West Bengal.

J.—SALT GOLAHs

Mention has already been made of the Salt Golahs. Salt Golahs have an interesting history. 'Golah' in the vernacular means a round building which in pre-British days was used for the storage of grain. It has since been applied to all buildings used for the storage of any commodity. It is a coined word synonymous with warehouse. The Salkia Golahs were declared public warehouses for the storage of salt under Bengal Government Notification No. 5737 dated the 11th November, 1909. They are situated on the western bank of the river Hoogly in the town of Howrah and occupy an area of $17\frac{1}{2}$ acres or 53 bighas of land. The land is "Mukrari Moorasi", i.e. it is a permanent lease. The annual rental is Rs.73/1/. The quarterly municipal rate payable to the Howrah Municipality for the Golah buildings is Rs.5,454/3/6.

The Salkia Golahs comprise of 58 buildings sub-divided into 206 compartments with a gross storage capacity of 42,93,700 maunds or 1,59,000 tons. The Golahs are a 'Central concern' maintained by the C.P.W.D. from funds in the Central Budget. The Golahs are electrically fitted. This permits the unloading of salt at night and loading of wagons of salt delivered during the day. The capital cost of the Golah is about 20 lakhs of rupees.

The advantages to the trade are immense and reflect credit on the foresight of the early administrators of the Customs Department. The Golahs were first opened to the public on the 29th March, 1853.

The facilities are:—

- (i) A foreshore of 1057 feet along which are 8 pontoons and 18 gangways for the landing and delivery of salt coming into bond and being despatched to reverain stations.
- (ii) A railway siding and turntable for the despatch of salt to stations served by rail.
- (iii) Four loading platforms where salt taken delivery of may be stacked free of rent for 4 days after which a nominal charge of Re. 1 per hundred bags is levied to prevent congestion on the platform.

- (iv) The erection by merchants of temporary tin structures for storage of empty bags on which ground rent at one anna per month is charged and that only to prevent squatter's right.

The rate of rental is Rs. 6/4/ per thousand maunds per month from the first date of storage till the Golah is finally cleared. But when the quantity stored is less than $\frac{2}{3}$ of the Golah capacity, rent is charged on $\frac{2}{3}$ capacity of the Golah. A lease has to be entered into and stamped. The rent is moderate in comparison with similar accommodation either in Howrah or in Calcutta.

The work of handling salt for the purpose of export and import is now in the hands of an approved contractor, at present Messrs. Eswardas & sons. The labour contractor, is entitled to realise certain rates duly approved by this Department. All charges are recovered direct from bonders and merchants and the department is saved all the work, worry and accounting that would otherwise result. In short, the labour involved in the receipt and delivery of salt does not cost Government a penny. This is a very satisfactory arrangement. The loading of salt into railway wagons, however, is now done by a different contractor.

Some years ago, a crushing factory was set up in the northern corrugated shed of the Salkia Golahs by the Calcutta Salt Association Ltd. The machine is fed by automatic arrangements and has a crushing capacity of about 400 maunds per hour.

The Golahs are under the charge of one Superintendent of Salt who is assisted in his work by two Inspectors, one clerk and some Workshop staff. In addition, there is an unarmed guard of a Jamadar and 30 Barkandazs (semi police) who are provided with quarters and receive two sets of uniform annually. A workshop is maintained for repair of the scales and weights used on board and ship and at the Golahs. There is a foreman incharge of the workshop under whom there are a number of blacksmiths, carpenters and other technicians.

Salkia Salt Golahs are the largest single storage unit in Calcutta. Apart from the fact that under the existing Salt (Reserve Stock) Order every importer is bound to store 10% of salt in the Salkia Salt Golahs, a very large quantity of salt is also stored by other persons in these Golahs. The Salt (Reserve Stock) Order, 1950, is under operation in order to ensure a steady stock which may be issued in the event of any emergency or shortage suddenly occurring. A minimum balance (now 12 lakh maunds) of salt is always held in Salkia Salt Golahs.

A statement showing the total quantity of salt stored in the Golahs and issued during the last 6 years is given below:—

Year	Opening balance	Receipt	Excess	Issues	Deficiency	Closing stock.
1950 . . .	17,39,291	57,59,258	36,640	45,33,946	50,578	29,50,665
1951 . . .	29,50,665	26,98,784	28,387	32,66,139	41,813	23,72,971
1952 . . .	23,72,971	22,96,762	13,476	21,42,815	30,806	25,09,588
1953 . . .	25,09,588	14,73,780	13,855	21,52,556	27,495	18,17,122
1954 . . .	18,17,172	15,65,697	6,658	14,02,656	19,500	19,70,371
1955 . . .	19,70,371	17,65,621	8,963	20,20,626	33,526	16,90,803

K.—PREVENTIVE MEASURES

The great bulk of salt consumed was easily and cheaply taxed at the ports of entry. In the interior of Bengal preventive measures were in the hands of the Commissioner of Excise and Salt under the local Government. Till 1930-31 the Excise staff used to patrol the saline tracts and destroy the spontaneous salt wherever it was found. The Delhi Pact of March 1931 (Gandhi-Irwin Pact), however, permitted local residents in villages, immediately adjoining areas where salt could be made or collected, to collect or make salt for domestic consumption or for sale within such villages, but not for sale to or trading with individuals living outside them. In accordance with this Agreement, the preventive officers did not interfere with the manufacture of salt by villagers in saliferous areas or its sale by them in neighbouring markets or bazars. But an abuse of the concession was inferred when salt was removed in carts or by means other than on foot. During the pre-Gandhi-Irwin Pact days about 200—300 salt cases were detected annually. With the Gandhi-Irwin Pact the number of cases decreased. However, the concession began to be abused and the cases of smuggling of non-duty paid salt also increased.

L.—HISTORY OF ADMINISTRATION

In the times of the East India Company the Board of Revenue controlled the Salt Department. Government depots, storehouses and excise golahs existed side by side with private Inland Bonded warehouses. In 1889-90 the administration of Orissa was transferred from the Government of Bengal to that of Madras to prevent illicit practices rampant at that time. Illicit manufacture of salt then increased in the maritime districts of Bengal and about 1898 a separate Salt Department for Bengal was created with administrative and preventive staff. The factories in Orissa were closed and preventive work again handed over to this Department. The control of the saltpetre refineries in Bengal was also transferred from the Northern India Salt Revenue Department to the Bengal Government in 1901. Up to April, 1947, the salt golahs in Bengal other than the inland bonded warehouses were administered by the Central Board of Revenue through the Collector of Customs, but matters relating to inland bonded warehouses, control of saltpetre refineries and soda factories and remission of duty on salt including educed salt used for industrial purposes and manufacture of salt were administered by the Government of Bengal through the Collectors of districts and the Commissioner of Salt and Excise. For this work the Bengal Government got an annual contribution from the Central Revenues.

The separate province of Bihar and Orissa was created in 1912. At that time the Commissioner of Salt and Excise, Bihar, took over charge of the preventive operation in the three saliferous districts of Cuttack, Puri and Balasore. The control of these operations then passed to the officers of the separate Government of Orissa. The control of the saltpetre industry in Bihar still remained with the Commissioner, Northern India Salt Revenue Department.

On the abolition of duty on salt, a separate Salt Department was organised early in 1948 with the Salt Controller (now Salt Commissioner) at the head and Regional Officers at Bombay, Madras, Sambhar Lake and Calcutta. Accordingly, the administration of the Salt industry in Bengal and Orissa, which had been under the Collector of Central Excise, Calcutta, was placed with effect from 1-9-48 under an Assistant Salt Controller

(now designated as Assistant Salt Commissioner) as the head of the Salt Region with headquarters at Calcutta. The administration of the Government Salt golahs, at Salkia also was transferred on the same date from the Collector of Customs, Calcutta, to the Assistant Salt Controller, Calcutta. Some staff came to the Salt organisation from the Central Excise department and some was recruited afresh.

Salt being no longer a revenue-yielding commodity, its administration is mainly concerned with the betterment of the industry in respect of improvement of the quality, increase in output and rationalisation of distribution, the last one being by far the most important function of the administration of this region.

Although distribution is the main function of the Salt Administration in the Calcutta region, it has its peculiar problems of production also. There are a number of comparatively small factories in Orissa and a few in Bengal also. These factories follow very crude process of manufacture. The Salt Experts Committee have suggested a number of measures, including large scale realignment of these factories for their improvement. Some of these recommendations have now been accepted by the Government of India and are being implemented by the Department. The Regional Officer has to keep a close watch on their implementation, the factories being directly under the supervision of Factory Officers and the Circle Officer (Superintendent).

The Ganjam, Sumadi, Astrang, and Surla factories in Orissa are also included in the Calcutta Region. The usual factory staff is posted at these factories and is responsible for manufacture, realisation of cess, distribution of salt, etc. The factories are under a Superintendent with Headquarters at Humma (in Ganjam district of Orissa) who exercises the general control over the factory officers and other staff. The single factory at Contai in Bengal is directly under the Assistant Salt Commissioner who is assisted by a Superintendent at Headquarters, Deputy Superintendents and Inspectors. The Salkia Salt Golahs are under another Superintendent who also works under the general control of the Assistant Salt Commissioner.

CHAPTER VII

BOMBAY SALT SOURCES

A.—HISTORICAL—HAKS—INAMS ETC.

Manufacture of salt in the Bombay State has been going on from times immemorial. During the time of the Mohammedan Rulers and the Peshwas (Mahratta Rulers of Konkan), revenue was derived by means of imposts on the privilege of manufacture and by transit duties on its transport from the place of manufacture. More than 500 salt works existed along the west coast and the Peshwas derived substantial revenue from this industry. Natural deposits of salt exist in several places along the east coast and the borders of the Rann of Kutch. All salt works on the Gujerat and Kathiawar coast and in the Rann were controlled by the Peshwas who exercised the power of veto of opening salt works. The British as successors to the Peshwas inherited these rights. By the Treaty of 1800 with the Nawab of Surat, the Moghulai share of the salt works in Surat came to the British Government and under Article 7 of the Treaty of Bassein of 1817, they also succeeded to the exclusive right of the Peshwas to the salt works in Gujerat. When the British took over reins of administration, the question of the practicability of deriving revenue from a salt monopoly in the Bombay State, similar to that established in Bengal, engaged their attention. In 1820, Mr. Dunlop, Collector of Ahmedabad, submitted a report on the salt works existing in the little Rann of Kutch and of the respective rights of the Chiefs and Agarias. At that time, the British derived an average revenue of Rs. 4 lakhs from salt, levied in different ways, of which the principal were transit and customs duties, sale of Government share of salt produced in works, which were the property of Government and a duty on the produce of private works.

In 1816 and 1823, the Bombay Government submitted to the Court of Directors, a proposal to establish monopoly in salt, similar to that of the Madras Government, at a maximum selling price of 45 lbs. per rupee or about Rs. 1/13/6 per Indian maund, which, it was estimated, would amount to a *per capita* tax of under 4 annas per annum. The proposal was negatived on the grounds that the State was still in a depressed and unsettled state and that the monopoly might cause a deficiency in the supply of salt, and consequent enhancement of the price beyond the amount of duty realised by Government.

The question of abolishing transit and town duties, taxes on trade and profession, came up for consideration. In 1826, Mr. Bruce, Member of the Bombay Customs Committee, proposed the abolition of transit duties generally and to replace them by an excise on the manufacture of salt equivalent to Rs. 6/4/- per maund. The proposal was generally approved by the Bombay Government and by the Court of Directors. In 1836, the whole question was referred for consideration of the Customs Committee for India. This Committee recommended the abolition of the transit duties and the levy of a uniform excise and import duty of 8 annas per maund on salt. Accordingly, Acts XXVII of 1837 and I of 1838 were passed. Thus, it was in 1838, that a regular excise upon salt came into effect.

The Act of 1838 was found defective in as much as the Collectors had no powers to forbid the manufacture of salt nor could they lay down rules for the manner in which salt should be stored.

Transit duties having been abolished, the Bombay Government turned its attention to the abolition of town duties, taxes on trades and similar imposts and to replace the revenue thus lost by an enhancement of salt excise. Bombay Act XVI of 1844, raising the excise and import duty on salt to Re. 1/- per maund and XIX of 1844 abolishing all town duties, taxes on trade and similar imposts were passed. But before Act XVI came into operation, a despatch was received from the Court of Directors prohibiting the levy of higher duty on salt in Bombay than annas 12 at which amount the duty was fixed by notification of the 14th September, 1844.

The tax on salt annually amounted to about Rs. 23,18,000/- and it replaced other forms of levies amounting to about Rs. 39,85,000/-. With the increased rate of excise, it was felt that a more stringent law for the protection of revenue was necessary. Act XXXI of 1850, was therefore, passed, the principal features of which were:—

- (a) A duty equivalent to the excise was imposed on salt imported from or exported to foreign territory.
- (b) Permission of Government was made necessary before opening new salt works or reviving old ones closed for 3 seasons.
- (c) Government were empowered to suppress any works which on an average of 3 years had produced less than 5,000 maunds per annum.
- (d) Preventive posts were established wherever required and not only in the vicinity of the salt works.

The Bombay Salt Tax was raised to Rs. 1/4/- per maund by Act II of 1861. The tax was successively raised to Rs. 1/8/- from January, 1865 and to Rs. 1/13/- from October, 1869. The duty remained unaltered till 1878 when it was raised to Rs. 2/12/-. At this time, the need for levying a uniform rate of duty throughout India was felt and in 1882, the Indian Salt Act, XII of 1882, was passed.

With the successive increase in the rate of duty, smuggling and illicit manufacture of salt increased and Government in 1868 appointed Mr. W. G. Peddar as an officer on Special Duty, for reporting on the internal management of the Salt Department as well as for re-organising the Salt and Customs establishments in the Department. Mr. Peddar's main recommendations were:—

- (1) Amalgamation of scattered salt works in the Rann of Kutch into one or two large salt works near Kharaghoda for the supply of Baragra salt to the whole of Gujerat by establishing Government depots in the various districts of Gujerat, situated north of the Tapti River;
- (2) Concentration of manufacture in the sea salt works and suppression of small scattered salt works producing less than 5,000 maunds annually;
- (3) Buying over the rights of petty maritime Indian States, such as Cambay, Janjira and Sawantwadi, of manufacturing salt in their territories; and also of the maritime States of Kathiawar and the inland States of Saurashtra and Deccan, where salt could be produced in saline tracts situated in their respective territory;
- (4) Establishment of Customs frontier to guard against the illicit imports from Portuguese territories and Kathiawar (Saurashtra);

- (5) Removal of salt after storage on the platforms and after being weighed and bagged instead of in bulk;
- (6) Conduct of test weightment at Preventive Stations; and
- (7) Re-organisation of the Salt Department under the Collector of Salt Revenue.

The Government of India accepted Mr. Peddar's recommendations and reorganised the entire department under a Collector of Salt Revenue. The Transport of Salt Act of 1879 was passed to prevent illicit landing of unduty paid salt from Kathiawar, Daman and Goa. A preventive line was established on the Portuguese Frontier.

Earlier in 1853, agreements were entered into with the Chiefs of Kathiawar for the regulation of manufacture and the trade in salt. These agreements were of three categories. The first was entered into with the six Chiefs of maritime salt producing States *viz.* Junagadh, Nawanagar, Bhavnagar, Morvi, Jaffarabad and Porbandar. The second with the four Chiefs of non-maritime salt producing States, and the third with the 25 inland Chiefs. In November 1895, a revised agreement so as to regulate production and distribution of salt was entered into by the Chief of Bajana. The Raja Saheb of Dharangadhra was also induced by a treaty of 1900 to give up manufacture of Baragra salt at Kuda. Similar agreements were taken in succeeding years from Kutch, Baroda, Cambay and Janjira, Sawantwadi and Deccan and Southern Marhatta States. All these treaties are printed in Aitchison's Treaties. (Vol. VII.)

Haks

During pre-British rule, hereditary rights were given to certain families to receive a certain share in the revenue in consideration of services rendered by them in connection with the collection of salt and customs dues on behalf of the then Rulers. These 'Haks' consisted of two considerations according to the Settlement of 1856, namely;

- (1) Cash allowance which was a profit to them, and
- (2) service remuneration which was a profit to them and to which they held no claim. The cash allowance represented the compensation to the 'Hakdar' for loss of his privilege to collect revenues and a profit to which he had a hereditary right. The question of cash allowance was settled once for all with the Settlement of 1856 by a special Commissioner. But the question of service remuneration remained a sore point with the 'Hakdars' and was the cause of frequent appeals. There were 28 salt and customs 'haks' of the total value of Rs. 12,589/15/8 out of which Rs. 5,726/15/3 were paid annually in cash to the 'hakdars' and Rs. 6,863/0/5 were deducted on account of services rendered by the clerks nominated by the 'hakdars'. Of these 28, the following four were salt 'haks':—

Name	Annual amount	Amount paid in cash or cash allow- ance	Amount deducted on account of service remuneration
	Rs. As. P.	Rs. As. P.	Rs. As. P.
1. Nimak Kulkarni of Pen	500 0 0	236 0 0	264 0 0
2. Salt Patki of Malwan	132 7 0	24 7 0	108 0 0
3. Dhru Kanuga Kharaghoda	4,382 10 0	2,189 10 0	2,193 0 0
4. Salt Kanuga Surat	1,034 1 0	446 9 0	587 8 0

The salt 'Hak' is a *vatan* or a hereditary office and is governed by the Bombay Hereditary Act of 1874. In 1916, on the recommendation of the Collector the right of the 'Hakdars' to nominate the clerks was extinguished as the clerks nominated were then illiterate and their cash allowance was increased by 10%.

The question as to what action should be taken in regard to these 'haks' following the abolition of the Excise duty on salt is at present under the consideration of Government.

B.—KINDS OF SALT

There are three sources of manufacture and supply of salt:

- (1) *Baragra Salt* : Manufactured in Kharaghoda Salt Works in the lesser Rann of Kutch from subterranean brine;
- (2) *Sea Salt* : Manufactured in factories along the coast from sea brine.
- (3) *Imported salt*.

(1) *Baragra Salt*

Inland—Kharaghoda—(a) System of Manufacture.—Baragra salt is manufactured in the Rann of Kutch. The Rann of Kutch lies between $24^{\circ} 40'$ to $26^{\circ} 6' N$ and $68^{\circ} 48'$ to $71^{\circ} 47' E$ 200 miles from east to west and in places 100 miles north to south. It is a vast flat, sandy and salty tract scarcely above sea level, marshy in portions, dry in others and covered during dry months with white saline efflorescent deposits. During the rains it is covered partly with sea water when the levels of the sea is raised and partly with waters discharged by the rivers Luni, Banas and *Saraswati* and all the surrounding high lands. The Rann is completely flooded in August and September up to 3' to 4' near the coastlines and 7' to 10' in the centre of the Rann. An enormous quantity of silt and sand is brought by the rivers. Successive layers of these are found in the sections of wells dug into the Rann.

The present condition of the Rann and tradition both point to the area having been an inland gulf the bed of which was slightly raised by seismic disturbances which are still felt at times and by deposits from the rivers and the shores. In times past the sea joined the Gulf at Hansthal creek and extended far inland up to Jodhpur along the river Luni. The level of the sea at Hansthal creek is 2.75' above mean sea level, and 30 miles inland opposite Kharaghoda and Kuda Salt works it is 6.78' in the middle.

The Rann covers an area of about 9,000 sq. miles and is divided into two sections, the Northern or Great Rann in which are discharged the saline waters of river Luni and the Lesser or Little Rann which is 40 miles east to west and joins the main sea at Hansthal creek.

At the end of December, the broad expanse of the saline waters begin to disappear by percolation, evaporation and drainage into the sea. The dry wintry winds from the north rapidly evaporate the flood waters and salt begins to form on the surface of the sandy desert. About the end of April strong south-west gales, accompanied with sand storms, blow so strongly over the Rann as to put an end by 15th May, to the salt manufacturing operations in the Rann at Kuda and Kharaghoda.

Salt is manufactured from natural brine obtained from the wells dug into the Rann in the soft deposits of gravel, sand, clay, gypsum, black soil and mud. The deposits vary in many places but generally are of about 25 to 30 feet in thickness and lie over the bottom of the old Gulf. Copious supply of brine is found in the fine and coarse sand layers varying in depths from the surface of the Rann from 14 to 20 feet.



Lifting of brine from Kuls

At the time when the British took over administration in Gujerat, a number of salt works existed along the Eastern shore of the Little Rann of Kutch, namely, in Patri, Udoo, Jhinjhuwada, Fatehpur, Anwarpur and Radhanpur. The British acquired the exclusive control over these salt works from the various Chiefs and worked them till 1873. On the recommendations of Mr. Peddar, these scattered salt works were closed down and from 1873 onwards, salt manufacture was concentrated at Kharaghoda under Government control. The Udoo salt works—8 miles from Kharaghoda—were opened in 1881-82.

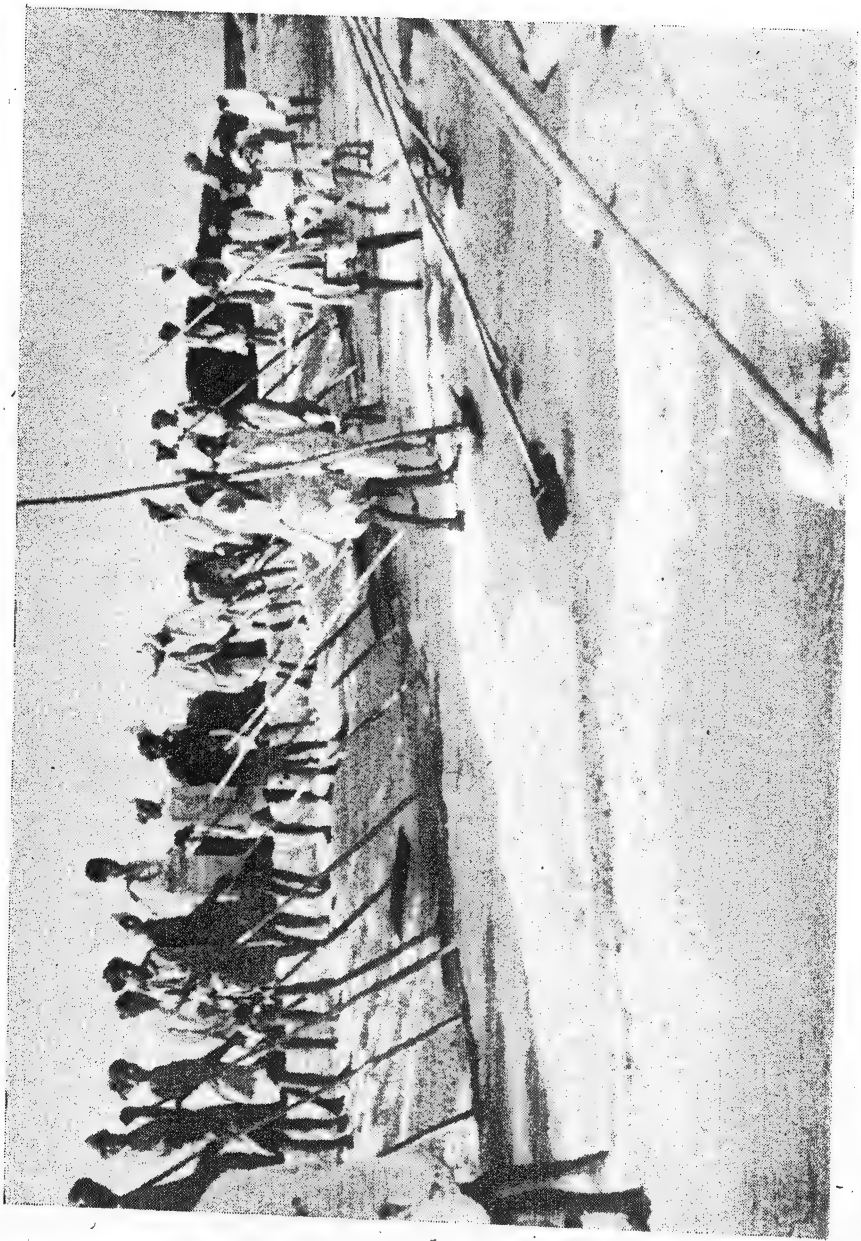
The Kharaghoda and Udoo salt works comprise an area of about 50 sq. miles and are worked departmentally by the Government of India. Salt is manufactured by Agarias residing at Kharaghoda and surrounding villages on Government account. It is their hereditary vocation. Salt is manufactured from sub-soil brine drawn by digging wells in the Rann. Every year, several hundred new wells are opened and also older ones which get silted up during the monsoon are re-excavated. The wells are about 20 to 30 ft. deep and about 9 ft. in diameter and are generally located near the crystallising pans. Sometimes when sufficient supply of brine cannot be struck near the pans, the agarias sink the wells at a distance of even 2 to 3 miles from the pans. There is at least one and sometimes 2 or more wells to a pan. A cylindrical bamboo or junglewood structure known as *Kantuwa* is inserted in the well to prevent the sides from caving in, but in spite of this lining, sometimes the sides collapse. When this happens or when the opening of the wells widens and becomes inconveniently large for lifting the brine, the well is abandoned. Brine is lifted manually by means of an earthen pot or leather bucket tied to end of a wooden post which is supported by a wooden structure known as *dhenkwa*, the other end being counterpoised with weight. Lifting of brine is done from about 3 A.M. till 10 A.M. and again in the afternoon. From deeper wells brine is lifted in a leather container called *Kos*, which is operated by means of a rope and a pulley and pulled by a pair of bullocks. Some wells run dry after a few hours of lifting operations, when they have to be allowed for rest for fresh recuperation. The brine yield varies within wide limits and the average is of the order of 300 to 400 gallons per hour, though an yield of 700 gallons per hour is reported from some of the wells.

The density of the brine varies from 11° to 21° Be'. It varies not only in different wells but also in adjacent wells and this is attributed to the thickness of the brine bearing strata as also to the possible dilution of brine by subterranean fresh water springs. From the comparative analysis of the Kharaghoda and sea brine shown in the table below, it will be seen that although it is similar in composition to sea brine, the proportion of Mg. chloride is higher and Mg. sulphate relatively lower than in the sea brine:

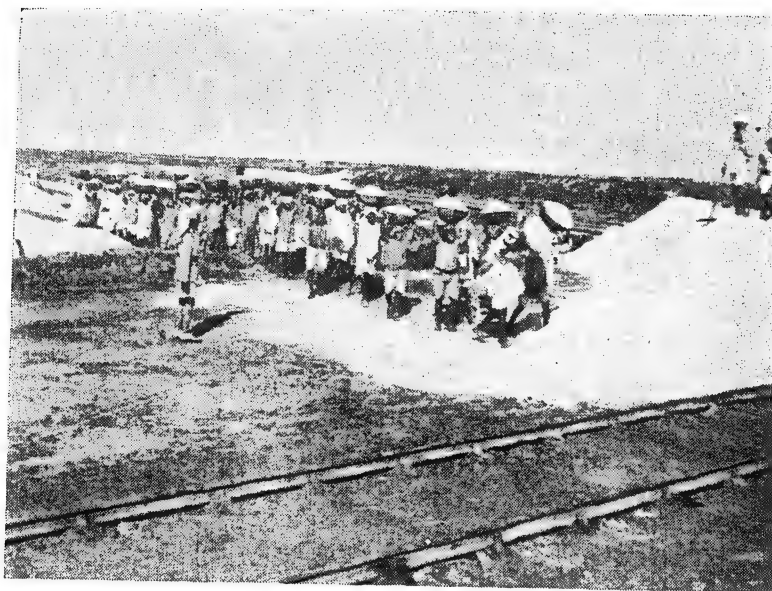
Comparative composition of Kharaghoda and sea brine

	(per cent on dry basis)	
	Kharaghoda	Sea
Sodium chloride	70.80	77.76
Mg. chloride	22.36	10.88
Mg. sulphate	2.31	4.74
Calcium sulphate	2.12	3.60
Calcium carbonate	0.06	0.34
Potassium chloride	2.00	2.46
Magnesium bromide	0.35	0.22
TOTAL	100.00	100.00

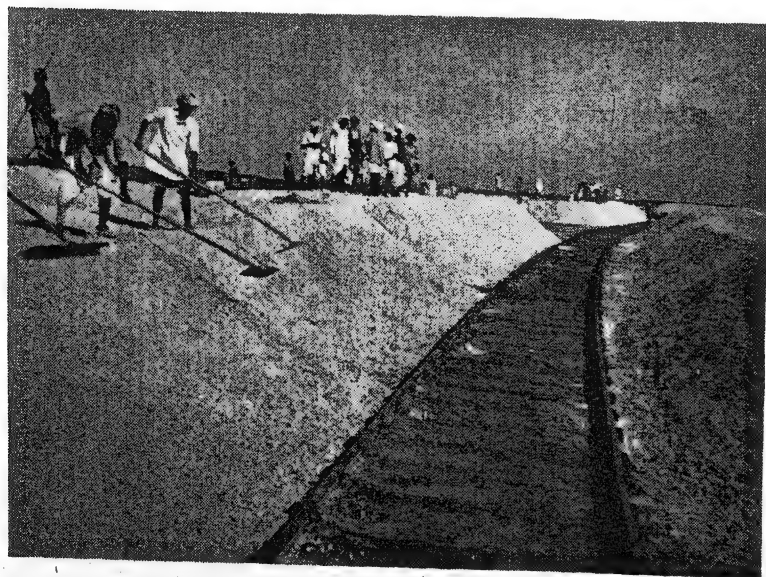
From the wells, the brine is led by gravity through *katcha* channels into reservoir-cum-condenser, locally known as "gamdu" situated just behind each crystalliser. The length of the channel depends upon the distance of the wells from the condenser. From the condenser, the brine is fed into the crystalliser. At present, about 800 pans are worked at Khara-goda Government salt works and each measures 250 ft. by 80 ft. and they are laid parallel to the Railway line with their length oriented in the direction of the prevailing wind. Before the *pucca* brine is let into a crystallising pan, its bed is puddled and made water-tight. It is then left to dry for a few days, after which some brine is let in and allowed to evaporate to dryness. The thin crust of salt which is formed is puddled into the bed of the crystalliser and more brine is let in. This process is repeated till the bed has finally become impervious and free from cracks. Brine of 23° to 24° Be' from the condenser is then let into the crystalliser for evaporation and deposition of salt. The crystallisers are filled initially to a depth of 2-3 inches and this level of brine is maintained above the layer of salt as it is forming. The brine of 23° to 24° Be' let into the pans is allowed to rise up to 26° Be' when fresh brine is charged to maintain the density between 25° and 26° Be'. Ten to twelve days after the salt has started to deposit, the crust formed is broken up and raked by a special type of wooden rake to prevent the formation of hollow or flaky crystals and to obtain the characteristic large size uniformly developed crystals known as Baragra, meaning a big crystal. When the salt is under formation, every alternate day, it is raked by means of a wooden dented rake and on the next smoothened with 'Pavdi' to prevent conglomeration of salt crystals, until the salt is ready to be lifted from the pans. After 1½ months from the date of the initial feeding of the brine, further supply of brine is stopped and the density is then allowed to increase up to 28° Be'. The bitterns (mother liquor) are then drained into another reservoir made for the purpose behind the condenser, locally known as "*farans*". The crystalliser is recharged with condensed brine to allow the crystals to grow further until about the middle of March. This Baragra salt is formed after it is fed gradually with brine for a period of 3½ to 4 months. By the middle of March, as salt in each crystalliser gets ready, it is ridged in parallel lines in the pan by means of 'Pavdis'. Then the bitterns are finally drained out into the 'faran'. Thus, the multiple irrigation or accretion system is followed for salt manufacture at this source, and the thickness of crust is about 3" to 6" at the time of its extraction. When the salt gets dry, it is removed from the crystalliser and heaps are formed in front of each pan. By the middle of April, storage of salt begins with the help of Railway authorities. Special types of B.G. wagons are loaded and hauled to the Central overhead rail track and the wagons unloaded into the closed and open stores meant for storing salt. The various rows of pans are laid with B.G. track line to facilitate storage of salt. The Government maintains sufficient B. G. open wagons for the purpose and locos are taken on hire from the Western Railway every year. Before the storage actually commences, the local Assistant Salt Commissioner weighs all the haulage wagons and takes their tare. He has also to weigh on the weigh bridge a sufficient number of loaded wagons so as to obtain a reasonable average for each siding. A scale has been laid down by the Government according to which loaded wagons are to be weighed. The average weight of loaded wagons for each of the sidings is separately calculated and an approximately equal percentage of the total output of each siding is weighed total percentage weighed being not less than 10% of the whole quantity stored. 50% of the test is to be carried out by the Assistant Commissioner himself and the remainder by the Superintendent of Salt. After deducting the tare on the basis of the average tare taken each



Ridging of salt



Heaping up of salt by rail side



Heaping up of salt parallel to Railway lines

day, the net quantity stored in the main salt stores is arrived at on which payment is made to the agarias.

In August every year, pans or crystallisers are distributed to the agarias, who come from the neighbouring villages and they commence laying out the pans and digging wells from September. Usually, a pan is given to two agarias and the average yield per pan is about 8,000 maunds for the season, all produced in a single crop. The agarias are given licenses annually and are bound by the conditions of the license. Prior to 1933, they used to be paid advances. The practice was stopped since the formation of the Agarias Co-operative Credit Society. They are paid wages according to the quantity delivered by each. Since June, 1950, they are being paid As. 7 per maund. With the inception of the Co-operative Society in 1933, advances to the Agarias are made by the Co-operative Society. Each Agaria, on an average, earns about Rs. 1,500 during the season. The loans advanced by the Co-operative Society are recovered from the Agarias at the time of annual payment in June. In order to assist the agarias, the Government of India are paying to them heaping charges at the rate of Rs. 3 per pan. They are also paid a sum of Re. 1 as loading charges, a fixed portion of which is being recovered from them at the time of making general payment.

(b) *Storage*.—Pans are constructed parallel and facing one another. A B. G. railway track from the Main Stores runs between two rows of pans. The pans at Udoo are about 8 miles away. As salt pans are worked where brine supply is available, a group of pans in each area connected by railway is known as siding. There are seven such sidings at Kharaghoda and 3 at Udoo. In March, when bitterns are discharged for the second time, the manufacturing operations come to an end. After the bitterns are completely drained out, the salt is piled in heaps in front of the pans alongside the railway tracks from where it is loaded in open wagons and hauled by railway engines to the Main Stores. The Store is situated near Kharaghoda Railway station and the loaded salt wagons are carried over to the Trestle bridges 24' high. The store covers an area of 9 acres and has a capacity to hold 55 lakh maunds of salt. Part of the stores to the length of 400 ft. on one of the bridges is covered and is used for bagging salt during the monsoon. This closed stores can accommodate 5 lakh maunds. When the whole rake is hauled up on the Trestle bridge, the side flaps of the wagons are opened and the salt is shovelled by manual labour to the platform below to form a heap on either side and in between the bridges. The salt is first stored in the closed stores and after it is filled, it is stored in the open stores. The store was constructed in 1873 and was extended in 1910-11 and again in 1921-22. The second Trestle bridge was constructed in 1921-22 and runs parallel to the first. The wagons used are all specially prepared with wooden bodies with falling sides and of capacity of about 200 B. Maunds. 16 per cent of the wagons are selected at random and are test-weighed on a weigh bridge each day during the storage and the total quantity of salt stored is thus arrived at. From the stores, the salt is bagged and despatched to various consuming areas of the country. The storage is finished in about two months' time, that is, by middle of June. The cost of temporary labour etc., engaged during storage varies from year to year. The wastage during the monsoon is considered to be about 5 % depending on the volume of rainfall. The average annual rain-fall at Kharaghoda is 18 inches. Humidity is low and fairly heavy winds blow during summer months culminating in frequent sand-storms. Continuous period of about 9½ months of dry weather prevails at Kharaghoda enabling manufacture and storage of salt without hindrance.

With the progressive increase in production, difficulty is being experienced in the storage of salt and with considerable difficulty the entire production of 72 lakh maunds was stored during 1952-53. During this year, two heaps on ground level had to be made. The Salt Experts Committee recommended the extension of the length of the Trestle bridges. They also suggested a more economical method of storage by using belt conveyors between the salt works and the main stores for raising salt to the required height of the heap.

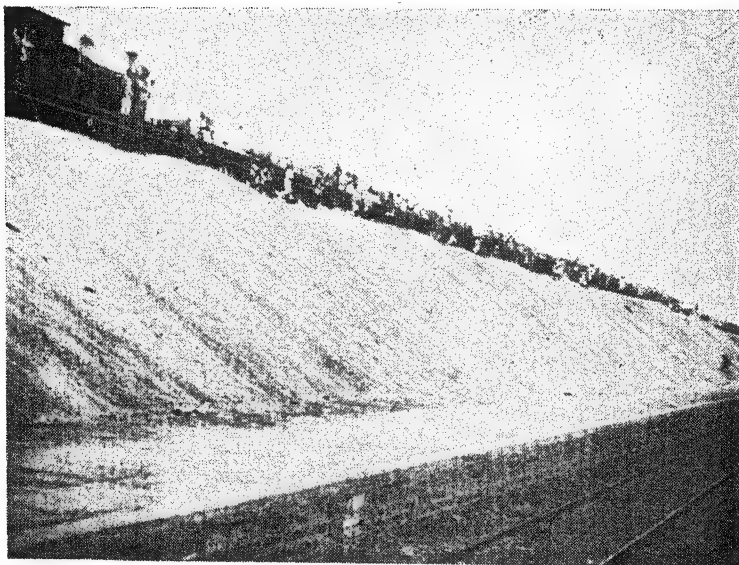
(c) *Production*.—Prior to World war II, the average production at Kharaghoda was about 30 lakh maunds per annum. The quantity to be produced during the year is fixed by the Salt Department before the opening of the season and the manufacturing programme is drawn up accordingly. Since 1947-48, with the drive for increased production of salt, production at Kharaghoda has been raised from 30 lakh B. maunds to about 62 lakh B. maunds per annum. During 1952-53, the production was 72 lakh B. maunds. The table below shows the production since the year 1908-09 onwards.

(In lakhs of maunds)

Year	Production
1908-09	26.8
1909-10	26.21
1910-11	31.19
1911-12	30.18
1912-13	28.27
1913-14	31.06
1914-15	31.79
1915-16	38.02
1916-17	30.28
1917-18	27.94
1918-19	32.18
1919-20	33.95
1920-21	49.44
1921-22	41.25
1922-23	45.27
1923-24	29.63
1924-25	15.61
1925-26	15.07
1926-27	12.69
1927-28	20.30
1928-29	27.55
1929-30	31.61
1930-31	27.10
1931-32	22.30
1932-33	30.65
1933-34	28.55
1934-35	35.85
1935-36	22.87
1936-37	34.22
1937-38	25.10
1938-39	34.42
1939-40	30.34



Loading of salt in Haulage Wagons



Unloading of salt at the main stores

Year	Production
1940-41	33.38
1941-42	34.96
1942-43	39.20
1943-44	33.79
1944-45	27.08
1945-46	33.07
1946-47	36.80
1947-48	36.91
1948-49	36.96
1949-50	50.98
1950-51	56.14
1951-52	61.51
1952-53	72.08
1953-54	62.95
1954-55	63.61
1955-56	68.74

The quality of salt is fairly uniform. With the increase in production the crystals of salt have become a bit smaller as more brine is added to form a larger bulk of salt. A somewhat high percentage of magnesium chloride is present in addition to calcium sulphate. The table below gives average analysis of Kharaghoda salt:

Analysis of Kharaghoda salt (on dry basis)

Sodium chloride	96.68 to 98.60
Calcium sulphate	0.71 to 1.55
Magnesium sulphate	0.05
Magnesium chloride	0.44 to 1.13
Insolubles.	0.09 to 1.42

(d) *Cost of Production.*—The cost of production of salt is mostly dependent on the price paid to the Agarias. Before the war, the rate paid was annas 2 per maund. It was increased on 1st April, 1946, to annas 4 and on 1st April, 1948 to annas 6 per maund. The present rate of annas 7 per maund was fixed in June, 1950. The price paid to the Agaria is based on the cost of living and the cost of materials and tools required by him in the manufacture of salt. In addition to the price paid to the Agarias, the Western Railway are paid for the hauling and hire of locomotives. Up to December 1933, the rate charged by the Railway was Re. -/10/- per ton. But when wagons for haulage of salt were purchased in 1933 by Government and maintained by them, the haulage charge was reduced to Re. -4/9/- per ton. This rate is reviewed every 3 years and the current rate is Re. -/10/- per ton tenable up to 1956. In addition, the Railways are paid for the maintenance of the Government railway track in the Rann sidings extending to about 22 miles. Besides these, other items which go to constitute the cost of production, are engagement of temporary labourers at the storage end, maintenance of buildings, water-pipes, weigh bridges, Trestle bridges supervision, over-head and rent for lands etc. Prior to the abolition of duty

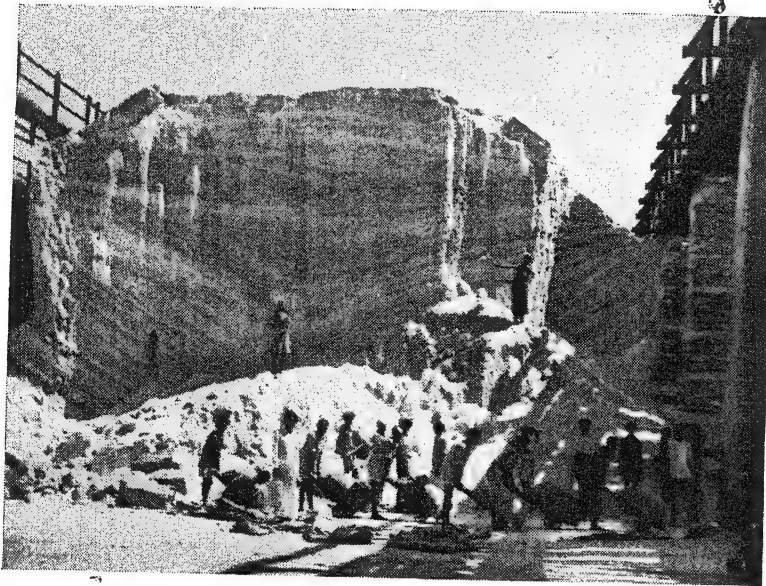
only a percentage of cost of establishment maintained at Kharaghoda was debited to the cost of production of salt, the balance being debited to "Collection of Duty". The Government of India have now decided that the entire cost of the establishment at Kharaghoda should be included in the cost of production. They have also decided to take into consideration, for the purpose of commercial accounts, 1/4th of the cost of headquarters establishment and 1/6th of the Regional office.

Prior to the World war II, the cost of production was about anna -/4/- per maund and in recent years, it has been as follows:—

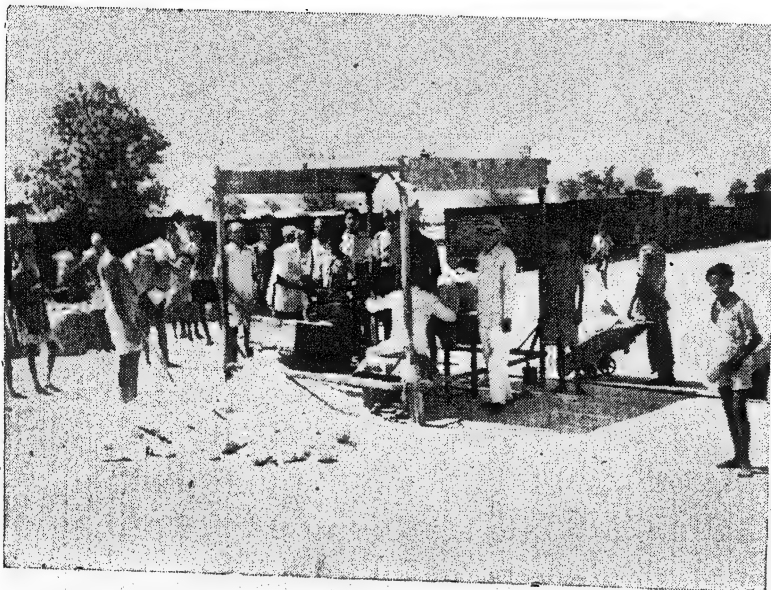
Year	Cost of Production		
	Rs. as. p.		
1948-49	0	7	5.57
1949-50	0	7	2.55
1950-51	0	8	4.17
1951-52	0	8	11.08
1952-53	0	8	11.80
1953-54	0	9	5.62
1954-55	0	8	11.90

(e) *System of Sales and Issues.*—When the scattered salt works in Gujarat were closed in early seventies of the last century and the work was concentrated at Kharaghoda, it was feared that the price of salt would rise. So, the Department appointed Agents for the sale of Kharaghoda salt, at fixed prices and opened depots at important Rail centres, like Surat, Broach, Anand, Ahmedabad etc. These Agencies were established with the object of securing to the inhabitants of the districts, formerly served by the salt works which were suppressed, the facilities for obtaining supplies and for protecting them against exorbitant charges on the part of the dealers and middlemen. The Agents were required to sell Baragra salt at a fixed price at Kharaghoda plus transport charges plus one per cent on the sales and one per cent for wastage. In 1904, the Agent's monopoly was abolished and free trade was introduced. Any trader was allowed to get salt from Kharaghoda. At the same time, the depots were allowed to exist. The Agents, Messrs. Nowrojee Pestonjee and Co, of Ahmedabad, however, continued to sell salt at the depots on receipt of a commission of 6 pies per maund only. This commission of 6 pies was raised in 1922 to 9 pies, in 1933 to one anna and in 1947 to one anna and six pies per maund. 30 depots exist at present.

The Government of India promulgated the Salt (Emergency Distribution) Order, 1942 with a view to make equitable distribution of salt and to check hoarding and profiteering as a result of war conditions. Under this order, 50% of Kharaghoda salt was supplied direct to the nominees of the Districts and the State authorities and 50 per cent to the Registered Dealers. With a view to prevent the rush of indents and to restrict the issues from Kharaghoda to genuine traders, the Kharaghoda Salt Indenting Rules, 1942, were framed which laid down a procedure for indenting and priority of issues from Kharaghoda. The Registered Dealers were allowed to charge a commission of one anna per maund. A rational scheme for the equitable distribution of salt was introduced from the 1st May, 1943.



Taking of salt bags for weighthment



Issuing operations at the main stores

According to this, a quota for each district and State was fixed on the basis of per capita consumption of 12 lbs. per annum. Though the Salt (Emergency Distribution) Order was withdrawn from the 1st March, 1946, the scheme of distribution continued till May, 1950, when the system of registration of dealers was abolished and buyers of salt were free to send salt indents direct to the Main Stores, Kharaghoda, or to nominate their agents in writing for taking delivery of salt on their behalf from Kharaghoda. In the States where the district nominee system is in force, nominees alone or their authorised agents at Kharaghoda are allowed to place indents on the Main Stores. Where there is no such system, indents are accepted from recognised dealers of the district whose names have been recorded at Kharaghoda as the consignees dealing during the last six months prior to May, 1950. Unified indenting rules are under the consideration of the Government of India.

Issues of salt are made direct from the Kharaghoda stores or from the Agency Depots in Gujerat. Salt is weighed in bags of 3 maunds each and loaded in B.G. wagons which carry 194 bags or 582 B. Mds. On payment of the issue price, the Deputy Superintendent of Salt I/C Main Salt Stores issues a permit to weigh clerks to weigh the salt. All salt is issued in bags. Bags are supplied either by the consignees themselves or by their authorised agents or by the bagging contractor who supplies new bags at a fixed rate and also does the filling and sewing of bags at fixed charges. The present rate of the latter is seven pies per maund. The price of salt is paid by consignees in any of the following ways, namely—

- (1) by insured post;
- (2) by direct payment at the Kharaghoda treasury;
- (3) by payment at the Ahmedabad treasury;
- (4) by payment of cost price etc. in the undermentioned treasuries of U. P. and treasuries of Bihar and the salt treasury at Sambhar.

U. P. TREASURIES

- (1) Dehra Dun, (2) Saharanpur, (3) Bijnor, (4) Moradabad, (5) Banda, (6) Hamirpur, (7) Jhansi, (8) Jalaun, (9) Allahabad, (10) Pratapgarh, (11) Sultanpur, (12) Rai Bareilly, (13) Fatehpur, (14) Kanpur, (15) Lucknow, (16) Unao, (17) Sitapur, (18) Mirzapur, (19) Banaras, (20) Jaunpur, (21) Faizabad (22) Bara banki, (23) Rampur, and (24) Bareilly.

BIHAR

- (1) Gaya, (2) Shahabad, and (3) Palamau.

SAMBHAR

Sambhar Lake Treasury.

(f) *Selling Price.*—Issue price of salt at Kharaghoda had remained constant from 1938-39 to 1942-43 at annas 4 per B. maund. From 1943-44, it has increased progressively year after year, mostly due to the increase in the purchase price of salt by Government from the Agarias and the current

price (1-1-55) is Re. -/10/6 per B. maund exclusive of all other charges, like cess of Re. -/3/6 per B. maund and bagging and sewing charges. The present over-all selling price is Re. -/14/5 as given below:

	Rs. a. p.
Issue price	0 10 6
Bagging and sewing charges	0 0 5
Central cess	0 3 6
TOTAL	0 14 5

When bags are supplied by the agents at Kharaghoda, the prevailing market rate is charged in addition. The rate of bag varies from Re. 0/12/- to Re. 1/- depending upon the market conditions. At Ahmedabad, the chief centre for distribution of Kharaghoda salt, the average market price of salt is about Rs. 2/- per maund.

The table below shows at a glance the cost, issue price and profit at the Kharaghoda salt works since 1938-39. The issue price is exclusive of excise duty at Rs. 1/9/- per B. maund up to 31-3-47 and cess charges of Re. -/3/6 per B. maund from 1-4-47 and sewing and bagging charges.

Year	Cost of production per maund	Issue price per maund	Profit
			Rs.
1938-39	0 3 7.27	0 4 0	36,339
1939-40	0 3 8.55	0 4 0	41,424
1940-41	0 3 8.48	0 4 0	51,326
1941-42	0 3 6.73	0 4 0	80,545
1942-43	0 3 4.38	0 4 0	95,700
1943-44	0 3 2.76	0 4 3	...
1944-45	0 5 2.02	0 4 6	6,680
		upto 30-4-45	
		0 5 0	
		from 1-5-45	
1945-46	0 5 9.26	0 5 0	18,219
		upto 31-3-46	
		0 5 9	
		from 1-4-46	
1946-47	0 5 8.23	0 5 9	53,337
1947-48	0 7 8.82	0 9 6	86,176
1948-49	0 7 5.57	0 9 6	5,47,757
1949-50	0 7 2.55	0 9 6	2,08,236
1950-51	0 8 4.17	0 10 6	6,62,278
1951-52	0 8 11.08	0 10 6	6,00,499
1952-53	0 8 11.80	0 10 6	5,75,812
1953-54	0 9 5.62	0 10 6	4,35,690
1954-55	0 8 11.90	0 10 6*	3,96,918

*From 1-6-1954 to 31-12-1954 it was reduced to As. 10 per md.

The Kharaghoda salt works are run on commercial lines. The accounts are audited by the officers of the Deputy Accountant General, Production, Commerce and Industry, Bombay and the Profit and Loss Accounts and Balance Sheet are prepared by them for each financial year. These are submitted to the Ministry of Production and the Ministry of Finance; and are placed before the public Accounts Committee appointed by Parliament.

Kharaghoda salt has always had a very steady market and the average issues before the World war II were 28.50 lakh maunds per annum. The principal markets were North Gujerat in Bombay State, U. P. and the Madhya Pradesh. With the introduction of the zonal scheme for the distribution of salt from 1949, Kharaghoda and Patdi stations are at present expected to supply to the extent of 88.95 lakh maunds per annum. According to the 1955 Zonal Scheme Bombay State is expected to receive 12 lakh maunds, Uttar Pradesh 44 lakh maunds, South Bihar 1 lakh maunds, Jammu and Kashmir and Madhya Bharat 5 lakh maunds each, Rajasthan 2.5 lakh maunds, Bhopal 1.7 lakh maunds, Vindhya Pradesh 4.6 lakh maunds, Nepal 1.5 lakh maunds and .6 lakh maunds will be sent to the Military. In addition to these allotments under preferential traffic under this scheme, salt owned by private manufacturers of Bajana, Patdi, Jhinjhuwada etc. can be booked to other consuming areas under ordinary traffic subject to the availability of wagons and the restrictions imposed on the import of salt by the State Governments concerned.

(h) *Other Salt works in the Rann.*—As the lesser Rann of Kutch provides natural facilities for the establishment of salt works, there are frequent demands for licenses for opening new salt works in the vicinity of the Kharaghoda salt works. The Department's policy ordinarily is to reject such applications for the opening of salt works within a radius of 10 miles of the Government salt works. At the request of the Saurashtra Government, however, two co-operative Societies comprised of the agarias of Bajana and Dehgam were granted licences in 1950 and 1951 for the establishment of a salt works in areas of 250 acres each. Private persons also started salt works at Patdi in an area of 100 acres. Several persons in the neighbouring villages have also since taken advantage of the concession granted by Government in 1948, allowing the manufacture of salt in 10 acre limits without a licence and have opened salt works at Jhinjuwada and Fatehpur, north of Kharaghoda during 1952-53. The estimated production of all these works is about 13.5 lakh maunds a year. The method of manufacture adopted by these private works is the same as that followed in Government salt works, namely, multiple irrigation and one crop which is taken out in April. The quality of salt produced is, however, somewhat inferior to that produced by the Government at Kharaghoda, as the manufacture is not done under proper supervision. As the site where the salt works are located are low lying areas, salt is first removed to high level areas and then removed to Patdi and Kharaghoda stations on the Kharaghoda-Viramgam line for ultimate despatch to consuming areas. The total production of these licensed and unlicensed units in this area in recent years has been as follows:—

Year	Production (B. Mds.)
1950-51	2,13,000
1951-52	12,39,000
1952-53	13,52,000
1953-54	14,64,000
1954-55	2,02,000
1955-56	9,55,000

(i) *Improvement of Salt works.*—For sometime past, the Kharaghoda works have been experiencing difficulty regarding the supply of brine in the wells as its supply is gradually decreasing. Dr. M. Sahani and Dr. B. C. Roy of the Geological Survey of India and Shri M. D. Mithal, Director, Central Water and Power Commission, examined the problem of locating suitable sites for the supply of brine and of determining the causes of variation in the out-put and density of brine in the existing wells. Dr. Roy and Shri Mithal also examined the possibility of constructing a Central reservoir and sub terranean percolation canal for the purpose of over-coming the brine problem. The view of the Geological Survey officers is that good brine is generally available to the west of the existing location of the Salt works away from sweet lands to the east. They were also of the opinion that there may be several horizons of concentrated brine strata in the little Rann at different depths which can be ascertained by tube boring going down to 150 feet or more. Dr. Roy recommended 12 exploratory bores to the depth of 100' in the first instance with a view to determining the possibility of good brine in that horizon. He also suggested that the most economical proposition for improving the method at Kharaghoda would eventually be sinking of hand-operated tube wells with provision for some mechanization for lifting in the case of good yielding ones and construction of permanent wells throughout the salt works. He recommended sinking of one dozen tube wells and one dozen permanent wells in the first instance and to watch their behaviour over a period of several years before launching any programme for large scale operation.

Dr. Roy was followed by Shri Mithal. He conducted a preliminary survey of the Kharaghoda salt works during February 1949. In a report prepared by him, he discussed the proposals of Dr. Roy. Among the recommendations and conclusions reached by him, the undermentioned are important:—

- (a) Gradual mechanization of brine supply to be spread over a period of five years in order to replace the present method of open wells, buckets and earthen drains.
- (b) Record of the strata met with at several depths and densities of brine should be kept as and when the wells are dry.
- (c) Topographical and contour survey of the Little Rann of Kutch should be made by the Survey of India.
- (d) A map showing contour of density of the sub-surface brine should be prepared every half year.
- (e) A soil survey of the Rann should be carried out to see if the surface is impervious enough to form the basis of reservoirs for impounding brine.
- (f) The Pioneer Magnesia Works should improve upon the existing method of carriage of bitters from "farans" to their factory premises.

The Salt Experts Committee appointed by the Government of India in 1948-49 also examined these problems and agreed with the recommendations of Dr. Roy, and to a certain extent of Shri Mithal. The Committee also agreed that the construction of reservoir and percolation canals were not practical propositions. The Committee recommended that the present type of wells should be replaced by tube wells in stages and spread over a period of five years and should be sunk in brine horizon 150 feet apart in 50 groups of 16 wells each.

For the improvement of quality and quantity of salt, the Salt Experts Committee made the following recommendations:—

- (1) Mechanical washing for the improvement in quality of salt:
- (2) Utilisation of all available pans each year and extension of the manufacturing season to the middle of June and taking of two crops, first in March and the other at the end of May.

Whilst the recommendation of mechanical working is under the consideration of the Government of India, the second was given a trial and found to be unworkable. The quantity of salt that was manufactured in the experimental pans after March was found to be powdery. The Agarias expressed their averseness to manufacturing salt in the same pans a second time for more than one reason, firstly, because they had to sink other wells for drawal of brine as the old wells by the time the new pans are prepared in March/April get completely exhausted. Then, the agarias who manufacture salt for several months suffer from physical exhaustion as the strain imposed is not recompensed by the out-turn of salt in the second crop. The salt is powdery and has to be mixed up with Baragra salt, before it could be marketed. Besides, extra precautions are required to be taken in order to prevent contamination of salt by storms and dust-ridden cyclones which is an usual premonsoonish phenomenon at the end of May at Kharaghoda.

(j) *Utilisation of bitterns.*—A part of the bitterns which are discharged from the crystallisers twice during every season are being utilised by Messrs. Pioneer Magnesias Works Ltd., Kharaghoda, under an Agreement with the Government. The Company's Agreement commenced in 1917 and it has recently been renewed by Government.

According to the revised Agreement, the Company:—

- (a) has to deposit security for the due payment of royalty of an amount not exceeding Rs. 5,000 or such amount as may be required by the President;
- (b) has to keep accounts of the stock of bitterns and of the magnesium chloride and other products manufactured;
- (c) has to maintain a Royalty book containing all the particulars necessary for the calculation of Royalty;
- (d) has to deliver to the Government every year after the Company's books are closed, a correct statement in writing, signed by the Director or the Principal Officer;
- (e) has to allow inspection of account books and documents of the Company by such persons as the Government may authorise;
- (f) has to remodel its factory at Kharaghoda according to the phased programme of implementations submitted by the Company subject to certain conditions; and
- (g) shall not dismantle any building, plant or machinery without the consent of the Government.

In return, the Company has been allowed to use roads and railway lines of the Salt Department at Kharaghoda for the purpose of manufacture of bye-products and removal of bitterns. It has also been given the right to draw sweet water for its use. The Government agreed to leave to the Company such lands as may be required for the purpose of manufacture and storage of its goods and other construction of plant, machinery etc.

The Company manufactures the following chemicals:—

Name of the Chemical	Quantity in tons.
Magnesium chloride	3,000
Magnesium sulphate	50
Magnesium carbonate	100
Calcium chloride	550
Potash salt	100

Up to 1951, the royalty on all the above products was recovered at Re. 1/- per ton and the average revenue to Government was about Rs. 3,000 to Rs. 5,000 per annum. The rates of royalty on products other than magnesium chloride and magnesium sulphate have been revised and fixed at one per cent of the ex-works naked selling price.

(2) Sea Salt

(a) *Land tenures and manufacturing rights.*—All along the West coast of Bombay State, salt works have existed from remote times. There used to exist a barter system at principal ports along the coastline where salt, rice, coconuts and similar commodities produced along the coastal districts used to be bartered against the produce of the Ghat districts such as spices, *gud*, tobacco, cereals, like *Jowari*, millet and pulses. Cash transactions were thus eliminated. During the years 1850-1870 as many as 682 salt works were in existence. There was, however, very important difference between the Gujerat salt works north of Daman and the salt works in the Thana, Kolaba and Konkan districts of Ratnagiri and North Kanara. Under the Treaty of 1800 with the Nawab of Surat in Gujerat, the Moglai share of the salt works in the Surat district came to the British Indian Government. Under Article 7 of the Treaty of Bassein, 1917, the British Indian Government succeeded to the exclusive right of the Peshwa (Maharattas of Poona) to the Salt works in Gujerat. Throughout the Gujerat, therefore, the salt works and the salt itself when manufactured belonged to Government. Government fixed the price of salt, which was everywhere Re. -/2/- per maund and paid each manufacturer when the salt was sold, at the fixed rate of Re. -/1/3 per maund, the balance of 9 pies being credited to the head, "Miscellaneous Receipts" under the head of proprietary right. The system was thus similar to that of Madras monopoly, but with the important difference that while in Madras, the manufacturer was paid for his salt as soon as it was made, in Gujerat not until it was sold. In the Surat and Broach districts of Gujerat, there were 26 salt works producing on an average 12 lakh maunds of salt per annum. On the recommendation of Mr. Peddar, all these salt works, except those at Dharasna and Chharwada were suppressed by the year 1878-79.

(i) *Dharasna-Chharwada salt works.*—These salt works situated in the Bulsar district are the property of Government. The Dharasna salt works were closed between the years 1858-60, and were re-opened in 1860 due to the large scale demand from the Malabar coast. While sanctioning the reopening of Dharasna agar in 1860, written agreement was taken from the agarias that the works would be closed at any time Government deemed it advisable to do so. The salt manufactured in the agars was to be sold at

Re. -/1/6 per maund of which one anna was to go to the agarias and six pies to Government. Secondly, Government was to incur no expenditure for the maintenance and repairs of salt works. Accordingly, since the re-opening of these salt works in 1860, all expenditure incurred for the construction of embankments etc. is borne by the agarias. The Chharwada salt works, 2 miles from Dharasna, were closed in 1886, but were re-opened in 1918 to meet the increased demand for Indian manufactured salt owing to difficulties of imports of foreign salt during the Great War of 1914-19. The acreage of these salt works is 690 and 420 acres respectively. The Dharasna Co-operative Salt Sale Society, which was formed in 1933 by the joint efforts of the Collector of Salt Revenue and the Assistant Registrar of Co-operative Societies, Surat, was granted a further piece of land ad-measuring 76 acres and 28 *Gunthas* as a drive towards increasing the production of salt. The licence has been issued in favour of the Society. Licences are granted to the agarias of Dharasna and Chharwada for the working of these salt works and each agaria is given an unit of 5 pans and one condenser measuring 100' x 100'. The total number of licences issued are 590. Each salt work is divided into *Jhillas*, each *Jhilla* having its own platform. The account of salt produced by each agaria is kept in individual name. Since 1935, the salt is sold by the Co-operative Society. The Society pays the agarias at the rate which the Managing Committee of the Society decides.

Since the abolition of duty on salt and the imposition of cess from 1-4-47, the rate of cess levied on salt issued from these salt works had been at the same rate as at other Government salt works, namely $3\frac{1}{2}$ annas per maund. On the representation received from the agarias, the Government of India decided to treat these two salt works on the same basis as other private salt works and the cess was reduced to two annas per maund. The Society was, till 1952, paying ground rent at 9 pies on every maund of salt issued from the salt works. Since this ground rent was incommensurate with the rate recovered at Bombay on lands given by the Bombay State, the Government of India, on a representation of the Society, decided to reduce the ground rent to 2 pies per maund of salt sold and ordered to treat it on par with the rate prevailing in the Bombay salt works. Also till 1952, Government used to collect three pies per maund as amelioration charges on salt sold towards constitution of a fund for the amelioration of the conditions of the agarias. From this fund, the Salt Department used to make certain fixed contributions towards maintenance of primary schools at Dharasna and Chharwada; a dispensary and payment to the agarias of a sum of annas five for every pan towards cost of repairs to embankments and grant of *pugrees* to agaria patels after the manufacturing season was over in recognition of the services rendered by them. The Society pressed for the abolition of this levy too as they thought that the levy was increasing the issue price of salt, making it difficult for them to compete in the areas served by the Dharasna salt. The Government thereupon decided to entrust this levy to the Society towards maintenance of schools and the dispensary etc. Accordingly, the dispensary was handed over to the Society with all its equipment free of charge except for the main roads which were in charge of the Central Public Works Department. The Society was asked to maintain roads within the salt works and also the sluice gates.

Until 1949, the Dharasna and Chharwada salt works enjoyed virtual monopoly over the Gujerat area. Production and price of salt at these salt Works had therefore to be controlled by the Department—production

being limited to about 4 lakh maunds. With the drive for increased production, two new salt works have been opened at Magod and Umbergaon. A Co-operative Society of villagers has also been licensed for purposes of sale of the spontaneous salt at the Dandi Sea Ford, about 15 miles north of Dharasna. This Society stopped exploiting the natural resources owing to opposition of the local villagers who were collecting salt in small quantities and removing it on head-loads. There is also a proposal for the formation of a Co-operative Society of the villagers of Bhagal near Dharasna for the manufacture and sale of salt. Import by land of salt from Portuguese territory of Daman is also permitted since 1949. Salt is also now permitted to be imported by sea from Saurashtra ports. In the year 1951 the Government of India cancelled their notification prohibiting import of salt from Kathiawar and from the Portuguese Settlements. This paved the way for import of salt from Saurashtra and Portuguese Settlements of Daman in large quantities. The imports from Saurashtra reached such proportion in 1952 that the markets of Broach and Surat, to which Dharasna salt was largely going, were appropriated by Saurashtra salt. In consequence, large stocks accumulated with the Society and a situation threatening to disrupt the economic condition of the Society arose. Salt to the extent of about 10 lakh maunds accumulated and the agarias began to starve as the Society could not pay them their dues until salt was sold. Their economic collapse was however avoided by the Government by securing for them new consuming areas, adjusting their sale prices suitably and organising a proper marketing organisation. Still the Dharasna and Chharwada salt works are faced with keen competition.

The system of production of salt followed at these works is the same as practised in the districts of Thana, Kolaba etc. on the sea coast and is described later on. The production of salt and sale at these works and its sale price per maund during the recent years have been as follows:

Year	Production B.Mds. (in lakh maunds)	Issues B.Mds. (in lakh maunds)	Sale price per maund
			Rs.
1948-49	7.40	5.51	..
1949-50	6.55	4.22	0 11 6
1950-51	7.51	4.77	0 12 6
1951-52	5.31	4.23	0 14 6
1952-53	5.15	8.45	0 15 9
1953-54	6.46	4.79	0 14 1
1954-55	5.28	7.78	..
1955-56	7.76	8.61	..

(ii) *Other Sea salt works.*—Other sea salt works, with the exception of Maroli, Shiroda and Sanikatta salt works which are situated in the Thana, Ratnagiri and North Kanara districts respectively, are all within a radius

of about 30 miles from Greater Bombay. Each group of salt works forms a taluka. A taluka is sub-divided into groups called *sazas*. The following is a list of the talukas:—

North of Bombay: (1) Dharasna-Chharwada
(2) Maroli
(3) Umbergaon

Around Bombay: (4) Bassein
(5) Rai
(6) Dadar
(7) Bhandup
(8) Trombay
(9) Belapur
(10) Uran
(11) Karanja
(12) Shewa
(13) Pen

South of Bombay: (14) Shiroda
(15) Sanikatta.

In addition to the Dharasna and Chharwada salt works, there are 13 other Government salt works, four in Bassein taluka, two in Dadar and seven at Shiroda which are owned by Government. Besides, one Government salt works at Dadar is now worked departmentally as a model farm since 1949. The 13 Government salt works are leased to private parties for salt manufacture on inviting tenders. Five salt works at Bhandup and one at Mira in Rai taluka are opened on Government land. The Bhandup lands comprise 2,562 acres and were acquired by Government in 1908 and divided into 7 plots. Tenders were called for but the parties backed out and the question of working the area departmentally was considered. The scheme was found to be very expensive and was, therefore, abandoned by the Government of India. In 1917, when an acute shortage of salt was experienced in India, the question was revived. Three parties applied for five plots and entered into a lease agreement for a period of 99 years. One of them, however, became insolvent in 1920 and the other two continued developing the area and eventually the five salt works were developed by 1928 and two plots remained unoccupied. One of these two plots comprising 750 acres was leased in 1950 and the salt works has since gone into production. The other undeveloped plot has also been leased to one of the existing salt works for enlargement of its reservoir area. All the remaining sea salt works are owned by private persons and have been constructed on lands wholly or partially alienated with or without quit rent. Due to different conditions of tenure of the various salt works, the assessment varies in the case of different salt works. In respect of some salt works situated on lands granted by the 'Peshwas', maximum assessment of Rs. 5 per bigha on the basis of pan area, is made. In the case of Juna Mukh and Juna Sonagar salt works situated in taluka Bassein, which are constructed on lands wholly or partially alienated with or without rent, the Government of India discontinued the levy of any additional establishment charges on the representation from their proprietors who urged that the levy of these charges was not justified any more because of the levy of As. 2 a maund

as establishment charges as cess from 1-4-47. This additional levy was discontinued from 1-1-1951. In respect of some, a maundage rate varying from 3 to 4 pies per maund was levied on account of ground rent and establishment charges. In respect of others, no ground rent was leviable, while in the case of some others only establishment charge was recovered. In 1941, the maundage rate was unified at the rate of 2 pies per maund and is now being levied in respect of salt works which were subjected to the maundage rate. This levy, however, does not apply to the salt works, which were subjected to land revenue assessment or both land revenue assessment and establishment charges. All salt works which have been licensed were also charged at the rate of 2 pies per maund, which has now been reduced to 1 pie. Out of total collections realised, an annual assignment of Rs. 36,000 is made to the Bombay Government on account of ground rent and they make no direct recoveries from the salt manufacturers. The Government of India also pay to the Bombay State since 1941 compensation at the rate of Rs. 2/- per acre in lieu of non-agricultural assessment which it forfeits by reason of the land being used for salt manufacture. This arrangement made in 1941 is, however, under revision now. The salt works owned by private individuals are in a number of cases, leased by the owners to others for periods ranging from 2 to 3 years on rental basis.

The bulk of the manufacture of sea salt in this State is thus in private hands and is subject to a licence granted by the Government. The licence is not given for any fixed period. It is valid until it is revoked. No licence fee is levied, and the privilege granted under the licence cannot be alienated wholly or in part by sale, mortgage or sub-letting, without the previous sanction of the licensing authority.

In the Bombay State, there are as many as six systems of land tenures as described above, out of which, one was designated as Inami system of land tenure, according to which, the holders of Inams or Kowls granted by the Peshwa Government or *sanads* by the East India Company enjoyed exemption from assessment of land revenue. In 1952-53 the Government of Bombay passed two Acts viz. (1) "The Bombay Personal Inams Abolition Act" and (2) "The Bombay Kauli and Katuban Tenures (Abolition) Act, 1953". In consequence of the passage of these enactments, all personal *Inams* are deemed to have been extinguished, if in the case of personal *inam* consisting of exemption from the payment of land revenue the amount of such exemption is or exceeds Rs. 5,000. Similarly, all *Kauli* and *Katuban* lands, are made liable to payment of land revenue. The Inamdars were called upon to surrender their *Kaul* and *Katuban* and *sanads*. The Collectors of Kolaba, Ratnagiri and Thana are at present considering the question of bringing such rent free lands, on which salt works in Bassein, Rai, Dadar, Trombay, Uran and Shiroda talukas are constructed, under Land Assessment. The Bombay Government is also considering the question of extending the application of Bombay Personal Inams Abolition Act to the lands held in Himatpura village by the Desai of Patdi (near Kharaghoda) who has utilised it for salt manufacture. If the abolition of personal Inams held by the Desai of Patdi is made applicable to his estate in Himatpura and other villages, his land will be brought under assessment and the Salt Department will collect maundage rate on salt manufactured by him.

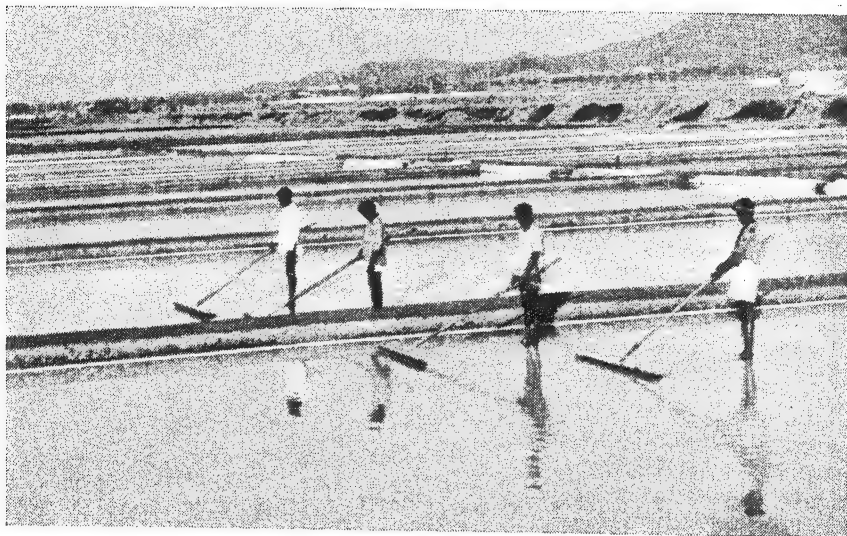
(b) *System of Manufacture*.—Although sea salt is manufactured entirely by solar evaporation, the process is quite different from that of manufacture of Baragra salt. Upon the fairly extensive alluvial flats inundated by sea water at each springs along the Gujerat and Konkan coasts, suitable site

is selected and reclaimed by construction of suitable embankments, if necessary, reinforced by stone pitching. The enclosed area is then divided by smaller embankments into three parts:—

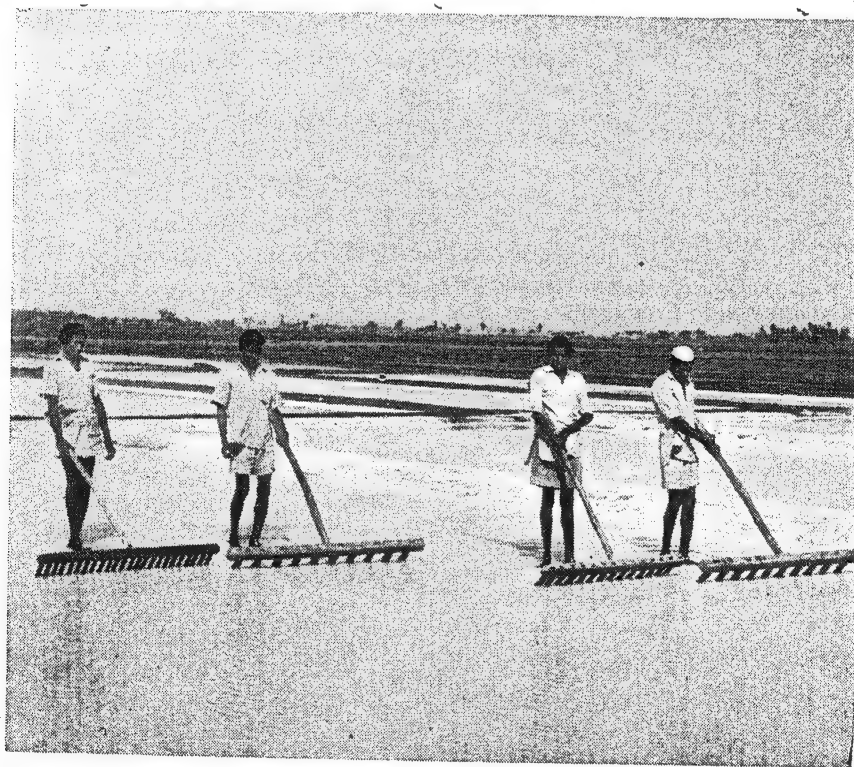
- (a) Khajina or main reservoir,
- (b) Tapawnee or condenser,
- (c) Ghans or feeding channels,
- (d) Crystalliser or the space where salt is made,
- (e) Ras-ghan or channel for removing bitterns after salt manufacture,
- (f) Sifting and dryage ground, and
- (g) Storage platform.

The levels of these different parts of the salt works are so adjusted that the "Khajina" can be filled at each high water spring by gravity; from the Khajina the brine flows slowly into the 'tapawanees' and when the correct density is reached, it is let into the crystallisers or 'kundis' through the feeding channels. The storage platform is generally located by the side of the creek through which sea water flows into the reservoir. This facilitates loading of salt boats at the time of issues. Also the reservoir has to be located on the landward which is on a slightly higher level so that the brine may flow by gravity first to the condensers and then to the crystallisers. The sifting or dryage ground is situated between the crystallisers and the platform. The proportion of the area of reservoir to condenser is generally 3:1 and that of condenser and the crystallising beds is 1:1. This proportion is not however, proper for producing good quality salt. To produce a better quality salt the proportion between the area of the reservoir and condensers and crystallisers should be 7:1. Crystallisers are rectangular in shape, about 6" deep and separated by low flat banks or ridges about 2 feet wide. The average dimensions of a crystalliser are 40 feet \times 10 feet but in some works they are larger and in others smaller.

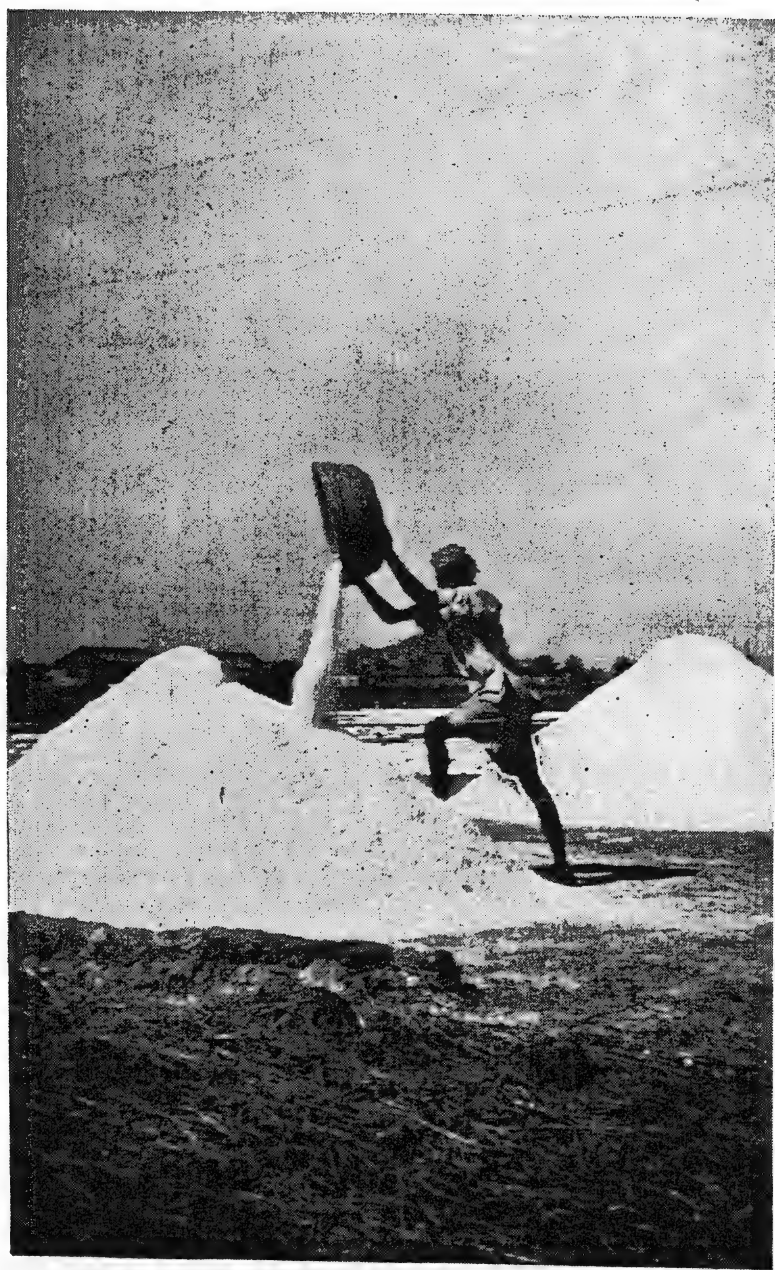
Immediately after the rains, the outer and inner embankments are cleaned and repaired and after removing silt from the beds of the crystallisers, they are trodden and beaten with wooden rammers till they become watertight. Actual salt formation begins at the end of December, and lasts till the rains set in, in the first week of June. The works come into full production in the latter months of March to May. During the fortnightly high tides, sea brine is admitted into the reservoir and allowed to remain there till it attains a density of about 5° Be. when it is transferred to the condensers. The brine is allowed to concentrate here till it attains the density of about 10° Be. to 16° Be. and then is led to the *Kundees* or crystallisers. The single irrigation system is adopted and three types of salt are produced, viz. Kuppa, Mapi and Vajni. The first two are light varieties of salt and are a speciality of Bombay. As retail sale of salt in the Bombay State and in several consuming areas is carried on by measure, mapi salt is popular and forms the bulk of the produce. The manufacturers take pride in the manufacture of this salt. The process generally adopted is to admit low density brine of not more than 10° Be. to a depth of 1". Refuse salt is thrown in to accelerate rise in the density of brine. The brine in the crystallisers is stirred daily by a wooden rake. Salt formed after a period of about 7 to 10 days is drawn on the ridges to dry on for a day. It is then taken to the sifting ground for being graded by passing through sieves of different meshes. Then the salt is stored on the nearby platform in conical heaps of 120 to 800 maunds before issue. Usually 4 grades are recognised



Raking of salt in the Crystallizers



Raking of salt in the pans



Heaping of salt on the platform

but in some salt works there are 5 to 6 grades. The price varies according to the grade. The first grade which is large grain fetches the highest price. The last variety which is very small grained is usually known as the "Calcutta" variety and is used for strengthening the brine or issued for industrial purpose. Mapi salt is hollow grained, light and grey in appearance. The other light variety salt is 'kuppa'. The process of manufacture of this variety is different. The pans are divided into small units of $6' \times 3'$ by grass ropes. Low density brine of 7 to 10° Be. is let into the pans to a depth of $1\frac{1}{2}$ and the pans are not raked or disturbed. The brine is not allowed to evaporate completely as in the case of mapi salt and the upper crust of salt is removed every fourth day and fresh brine is added to the mother liquor left in the pans. This salt is white, flaky and brittle and not good enough for long transport. The Salt Experts Committee (1948-49) had strongly recommended the stoppage of manufacture of the light varieties of salt and the Government of India had in 1950 banned their production. On the representation of the manufacturers and the recommendation of the Government of Bombay, the ban was removed and their production is continued. The Government of Bombay has, however, on the recommendation of the Central Government, ordered the stoppage of sale of salt by measure throughout the State. This order is, however, not being applied strictly and the sale of this salt by measure continues unrestricted, as before. For the manufacture of 'vajni' or heavy salt, strong brine of 16° to 17° Be. is admitted into the pans and when a crust of $\frac{1}{2}$ " or so is formed in about 12—15 days, it is raked and brought to the embankments and platforms without being sifted. The manufacture of this salt is usually undertaken towards the end of the season i.e. in April or May when it is easier to get higher density brine. The average output per pan during a season is about 70 to 80 maunds, in the case of light salt and of 120 to 150 maunds in the case of 'vajni' salt.

(c) *Quality of Salt.*—The average quality of salt produced in Bombay is poor. Analysis of samples of Bombay sea salt is indicated in the table below:—

	Mapi	Vajni	Kuppa
	%	%	%
Sodium chloride	91.34	92.58	95.92
Calcium sulphate	1.20	1.02	0.86
Magnesium sulphate	2.31	2.12	0.80
Magnesium chloride	3.21	3.18	1.69
Insolubles	0.82	0.69	0.25
Undetermined	1.12	0.41	0.53

Calcium sulphate, magnesium sulphate and magnesium chloride are the common impurities, the total percentage of these salts being 5.0 to 7.0. This is due to the defective layout of salt works and the tendency of the private manufacturers to continue the old method of manufacture.

The ratio of condensing to the crystallising areas in most of the salt works being 1:1 or 2:1, brine of lower density is let into crystallisers with the result that calcium sulphate separates out before salt precipitates. Further, since the bitterns are not drained out before each new crop is taken,

magnesium salts contaminate the crystals of salt. If the beds of the crystallisers are not properly prepared or sufficient care is not taken while scraping the salt, insoluble impurities, such as clay and grit also get mixed with salt.

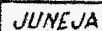
The question of improving the quality of salt was considered by the Salt Experts Committee which recommended that the salt works should adopt the proper ratio between the crystallisers and the reservoir-cum-condensers. The ratio of 1:7 was suggested with the adoption of proper procedure for concentration of brine and extraction of salt. They recommended the setting up of model farms by Government for demonstrating the proper procedure. The Committee also suggested that small units should combine and form into economic units which should not be less than 100 acres each. The manufacture of light grade salt was recommended to be stopped and quality control imposed. The Salt Research Committee of the Council of Scientific and Industrial Research also agreed with these views. On the basis of these recommendations, the Government of India decided to run departmentally one of the Government Salt Works at Wadala as a Model Farm.

In 1950, the Government of India in the then Ministry of Works, Production and Supply announced their decision to gradually raise the standard of purity of salt to 96% sodium chloride content, the first prescribed standard being at 92% in the year 1951 and raised it by 1% year by year to 94% in 1954. This led to considerable dissatisfaction among the sea-salt manufacturers of Bombay State, where sub-standard salt was manufactured in considerable quantities. Some of the salt manufacturers took to realignment of their salt works keeping the ratio of 1:7 between the crystallisers and the condensers-cum-reservoir. The manufacture of kurkutch quality of salt which usually contains about 96-97% of sodium chloride was started by some of them after seeing the production of this salt (kurkutch) at the Model Salt Farm at Wadala. The quality control is now being enforced and issues of salt found sub-standard on analysis for human consumption are not allowed. The Government of India have recently announced their decision of exercising similar control on the quality of salt manufactured even by small scale concessionaires operating in areas less than 10 acres each. With a view to enforce this control, survey of all the unlicensed salt works was taken. Proposals to have the samples of small scale works analysed before salt is allowed for human consumption through the factory officers are under consideration.


The following table indicates the quantity of salt found sub-standard since 1952 in the sea salt works of Bombay State at the time of first analysis of the stocks concerned. Salts produced in the sea salt works of Kathiawar and in the Rann have always been found to be standard:

Year	Standard of purity (% NaCl)	Quantity produced (1000 Mds.)	Quantity found Sub-standard (1000 Mds.)	% of sub-standard salt
1952	92.5	1,23,25	22,37	18.15
1953	93.5	1,39,72	11,69	8.37
1954	94	1,23,98	27,34	21.00
1955	94	1,33,43	10,80	8

SCALE 1" TO 230 FT.



REFERENCES

SIGN	PARTICULARS	AREA		
		ACRES	GUNTHAS	ANNAS
	RESERVOIR	08	25	08
	CONDENSER NO. 1	20	35	08
	- do - " 2	06	32	00
	- do - " 3	03	10	00
	- do - " 4	01	23	00
	SALT - PANS	07	06	00
	STORAGE PLATFORM	02	09	00
U.L.	UNCULTIVATED LAND	02	04	04
	CHOWKEY	00	00	12
	TOTAL	54	26	00

The standards fixed for 1952 and 1953 were subsequently lowered by 0.5%. Almost all of the sub-standard salt gets standard after the following monsoons

Experimental Farm and Analytical Laboratory, Wadala

The Sulemanshah Salt Works at Wadala was remodelled in the year 1949-50. The total area of the works is 54 acres and is fed by 2 creeks. The table below shows the distribution of the acreage of this unit before and after its remodelling:—

	Before remodelling	After remodel- ling
	Acres	Acres
Reservoir	16.5	8.25
Condenser	13.0	34.20
Crystallisers	21.0	7.15
Platform	2.0	2.20
Uncultivated land	2.0	2.10

Before the remodelling, the pan area of 21 acres comprised of more than 800 pans. Some of this area has now been utilised for condensers by levelling out of the pans. The whole condensing area of 34 acres has been divided into 4 compartments of 20.35, 6.32, 5.10, and 1.23 acres. Some of the old pans with a total area of 7.15 acres were remodelled into 48 pans each 125' × 40'. Hard bed crystallizers were prepared by tamping the soil. As both the creek and the reservoir were badly silted and the supply of brine was not adequate and full advantage of the evaporating area could not be taken, the reservoir area was suitably desilted to the extent of 1½' and a diesel engine and pump installed for lifting the brine from the reservoir to the first condenser, which is now on a higher level. A plan of the Model Salt Farm is shown on the opposite page.

The improved method of manufacture adopted is as follows:—

Sea brine of 2° to 3° Be. is admitted into the 5 compartments of the reservoir, where it gets concentrated to 4°—5° Be. It is then admitted into the first condenser, where the density rises to 5°—7° Be. The brine is led in succession to condenser 2 (10°—11° Be.), condenser 3 (17° Be.) and condenser 4 whereby the density reaches 24° Be. Two feeding channels supply brine from condenser 4 to the crystallising pans. Sufficient 24° Be. brine is obtained in about 2 months' time since the taking in of the first tide. The multiple irrigation system is followed. Brine of 24° Be. is led into the pans to a depth of 2" to 2½" in the beginning of the season and later 3" to 3½". The brine is allowed to concentrate up to 28° Be. Fresh brine of 24° Be. is admitted from time to time to maintain the density of the brine in the pan below 28° Be. The salt which precipitates out every day is allowed to remain in the pan and when a new bed of crust is formed, it is broken up by *pavdies* leaving an ½" crust undisturbed. The loose salt is then raked with wooden rakes and as the crystals develop, rakes with different cleaves between the teeth are used. After 4 or 5 weeks the bitterns are drained out through the bitterns channel and the salt collected and washed in the pans with fresh brine of 24° Be. and then brought

to the embankment and allowed to dry for 2 or 3 days before being taken to the storage platform. 4 to 5 crops of salt are thus recovered every season from about November to end of May. Salt thus produced is very white and of high purity as will be seen from its average analysis below:

	on dry basis
Sodium chloride	97.99
Calcium sulphate	0.49
Magnesium sulphate	0.72
Magnesium chloride	0.78
Insolubles . . . . .	..
Undetermined	0.02
	<hr/> 100.00
Moisture	4.61%

The Model Farm is being worked departmentally since 1950-51 and cost of production of salt has been as follows:

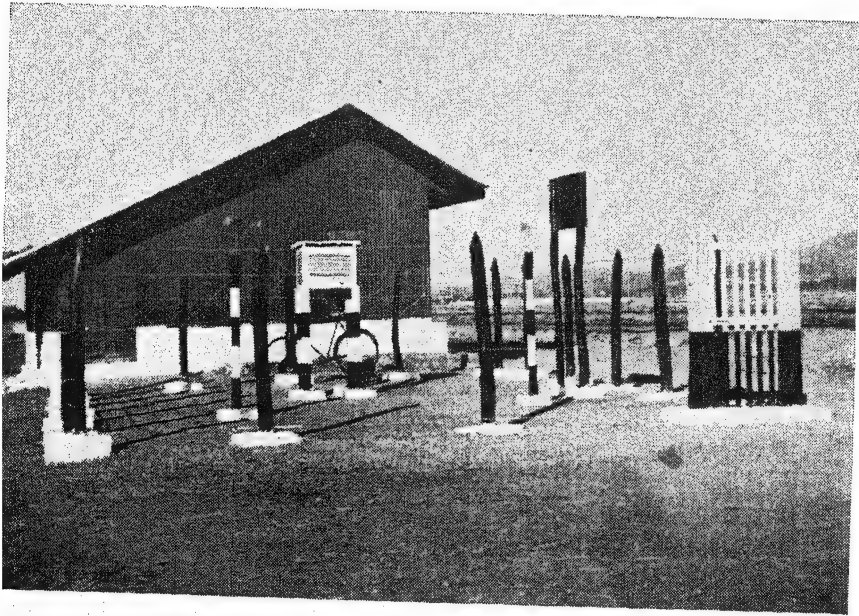
Year	Production (B. Mds.)	Cost of production per B. Md.
1950-51	40,000	Rs. as. ps. 0 11 11
1951-52	39,000	0 12 1
1952-53	48,000	0 6 9
1953-54	66,000	0 5 5
1954-55	64,000	0 4 10
1955-56	62,000	N. A.

The present production per acre is about 1,200 B. maunds. It is proposed to treat it as a commercial concern after a couple of years when its functioning has stabilised. The salt produced here is sold every year by inviting tenders and the rate of sale (inclusive of cess charge of Re. -/3/6 and ground rent of 2 pies per maund) ex-works for 1953-54 crop was Re. -/10/2 per maund. This salt is mostly despatched by rail to markets in North Bihar.

A properly equipped laboratory is attached to the Farm to control the quality of production and samples of salt from the various salt works are also analysed here.

Research work is also undertaken. The meteorological data regarding rate of evaporation, rainfall, humidity, wind velocity etc. is being maintained. Manufacture of mixed salt, collection of gypsum etc. is also proposed to be carried out.

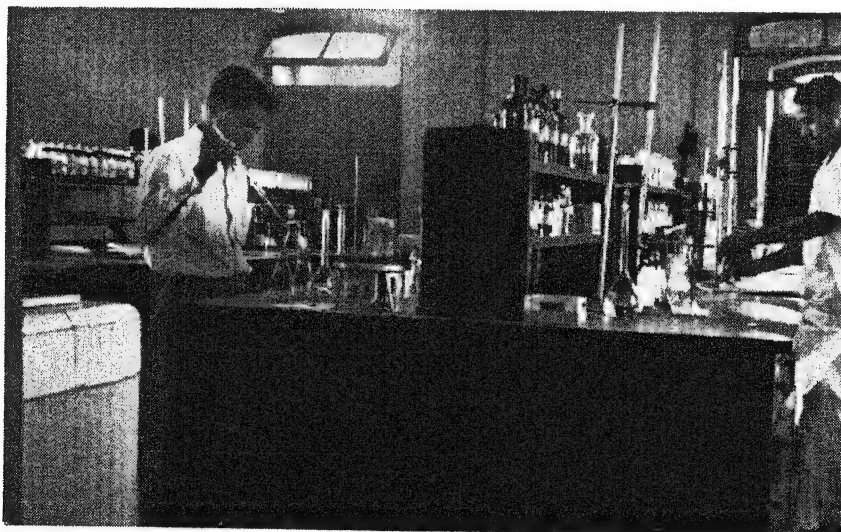
The Model Farm has conclusively proved that even under conditions as prevalent in Bombay, high grade salt can be manufactured under properly controlled methods. Salt manufacturers from various parts of the country



Meteorological station



Wadala Salt Laboratory



Inner view of the Laboratory

visit the Model Farm and technical guidance is given to the local manufacturers. Under departmental guidance, many of the manufacturers are now taking steps to gradually realign their salt works. A duly qualified Superintendent is in charge of the Model Farm and the Laboratory. He is assisted by qualified analysts to handle the analysis work etc. About 1,000 samples are analysed every year.

(d) *Production.*—The following statement shows the output of salt from the sea salt works:—

Bombay Sea Salt

(figures in '000 maunds.)

Year	Production	Year	Production
1908-09	97·84	1932-33	82·80
1909-10	91·11	1933-34	115·17
1910-11	96·08	1934-35	104·87
1911-12	102·75	1935-36	85·96
1912-13	108·56	1936-37	99·05
1913-14	95·78	1937-38	85·71
1914-15	107·86	1938-39	102·45
1915-16	92·21	1939-40	94·58
1916-17	89·35	1940-41	96·87
1917-18	85·35	1941-42	132·74
1918-19	133·70	1942-43	107·20
1919-20	91·09	1943-44	113·36
1920-21	90·72	1944-45	123·15
1921-22	79·19	1945-46	115·31
1922-23	110·06	1946-47	64·15
1923-24	107·50	1947-48	123·49
1924-25	80·22	1948-49	120·89
1925-26	103·54	1949-50	104·44
1926-27	97·32	1950-51	130·21
1927-28	99·22	1951-52	114·29
1928-29	109·77	1952-53	126·93
1929-30	107·56	1953-54	139·06
1930-31	104·02	1954-55	126·99
1931-32	87·66	1955-56	131·92

The sea salt works in the Bombay State number about 401 and the area under salt cultivation is over 17,000 acres. The average production per acre is 600 Mds. per annum. Over a considerable period it had been the Government's policy not to grant fresh licences and to close down salt works producing less than 5,000 maunds per annum as the cost of establishment for collection of revenue was not considered commensurate with the revenue realisations in such units. Thus, except for the development of the five Bhandup salt works and one at Mira, in 1928, no new salt works was opened since 1885-90. With the abolition of salt duty from 1947 and with the drive for self-sufficiency in the supply of salt, it has been the declared policy of the Government of India to bring all available land fit for salt manufacture under cultivation by private enterprise. In 1950, two new salt works were opened at Umbergaon and Meh-Magod. Subsequently, some more salt works came into being. At Nandgaon near Dahanu taluka, the State of Jawahar opened a salt works called, "Prema Bunder salt works", but it soon closed down for lack of transport facilities etc. Two salt works were opened in Turma and Padkop villages. The alignment of these salt works is on approved lines. Another one is under construction at Bhandup which has already gone into production.

The production of the sea factories prior to the World war II was 90 to 110 lakh maunds per annum, the average being 95 lakh maunds. During recent years the average production has been 120 lakh maunds. In 1950-51, the record figure of 130 lakhs was reached. Big talukas like Rai, Bassein, Shewa produce about 15-20 lakh maunds each. Talukas like Uran, Trombay, Dadar, Belapur about 8-10 lakh maunds each. In the rest of the talukas the production ranges between 1 to 5 lakhs.

Although production of salt is primarily dependent on favourable weather conditions, it is also to a certain extent controlled by the Bombay Salt Merchants and Shilotries Association by fixing the date for the commencement of the season and this is done taking into consideration the balance of salt and the market conditions etc.

(e) *Cost of production.*—At the sea salt works, there is little reliable data of the cost of production as these are in the hands of private individuals and moreover, the cost varies according to the rates of local labour, transport charges, means of transport and the distance between the salt works and despatching Railway station or port of shipment. Principal items of expenditure are as follows:—

- (1) Wages of the labourers;
- (2) Repairs and maintenance charges of the salt works;
- (3) Lease money paid to the proprietor;
- (4) Materials and implements; and
- (5) Supervision charges.

At the Juchandra salt works in the Bassein taluka, the wages paid to the labourers, who are local villagers, are considerably higher than the wages paid to imported labour from Surat district. The lease money also depends on the location of the salt works and their layout and construction. The

Salt Experts Committee, in their report, have attempted a break-up of the cost of production of salt in the Bombay works which is as follows:—

	Rs.	as.	ps.	
(1) Cost of manufacture	0	12	9	Per maund.
(2) Ground rent	0	0	3	Per maund.
(3) Lease money	0	3	6	Per maund.
(4) Over-head and supervision charges	0	2	0	Per maund.
(5) Maintenance	0	2	0	Per maund.
(6) Depreciation	0	0	6	Per maund.
TOTAL	1	5	0	

At the Model Salt Farm, Wadala, which is worked departmentally, the cost of production is lower as no ground-rent or lease money are payable. The average cost of manufacture in private factories would seem to be between Re. -/8/- to Re. -/12/- per maund; the cost in the case of lighter variety of salt (*viz.* mapi and kuppa) being higher than that of heavier variety (*i.e.* vajni). While examining the cost of production at the Bombay sea salt works, the Salt Experts Committee has remarked that the incidence of cost of labour is high. This is due to the fact that the output per man per month is only 100 maunds as compared to 272 maunds in the Saurashtra factories. The Committee accordingly, suggested that the system of piece work employed in Saurashtra factories should be tried out to obtain higher output at a lower cost. They also suggested simple labour saving devices, particularly, trucks and lorries for removing the salt from the pans to the storage yard, in the first instance in the larger works.

(f) *System of Sales and Issues.*—Sea salt works being owned by private individuals, the purchaser deals directly or through ‘*Dalals*’ with the manufacturer. When Salt Duty was in existence, the purchaser paid the duty in cash at the taluka office under the *Sarkarkun* or in the office of the Chief Accounts Officer in Bombay or in an authorised treasury. The credit system in force under the Indian Salt Duties Act X of 1908, was abolished in 1932. The factory officer permitted the weighment of salt and all salt was issued in bags. Weighment of salt used to be carried out on the storage platforms on steel yard scale suspended from moveable bamboo tripods. Salt was issued in one maund, two maunds and two and a half maunds bags. A permit was issued for the removal of salt by sea or rail *via* a check weighment station, and the route was prescribed therein. At the check weighment station 15 per cent of the bags used to be test weighed. Since the abolition of duty in 1947, no material change has been made in the procedure for clearance of salt from the salt works except that weighment at the factory is not carried out under departmental supervision. Also at the check weighment stations, instead of 15 per cent weighment, only 5 per cent weighment is now done. The salt manufacturer or trader is required to pay in advance due cess and ground rent charges in a revenue treasury on the quantity of salt proposed to be removed and to present the challan to the factory officer—the departmental treasuries having been abolished after the abolition of salt duty. On presentation of the Treasury challan, the factory officer accepts the application and issues permit for removal of salt to the extent of the quantity covered by the challan. Traders are allowed the facility of opening accounts current with the factory officers to avoid frequent deposition of due charges in the Treasuries.

Transport from the salt works to the booking railway station is done either by:—

- (1) bullock-carts or motor trucks;
- (2) sailing vessels; and
- (3) push trollies depending upon the situation of the salt works and the availability of facilities for despatch of salt.

Such transport charges from the factory to the loading station vary from station to station. The highest charge is at Pen where salt has to be taken about 20 miles by road to Khopoli station and the cost comes to about Re. -/10/- per maund.

(g) *Selling Price.*—At the private sea salt works, it is not possible to know the selling price with any degree of accuracy. According to the information given by the shilotries in the application for permits, the rates vary from Re. -/12/- Rs. 1/10/- per B. maund ex-railway station. The Salt Experts Committee had remarked that the selling price of salt in Bombay should be scrutinized and lowered, if possible, as the profit made by the manufacturers appeared to be on the high side.

(h) *Distribution.*—The Bombay salt used to be consumed in the State of Bombay and was also sent to Madhya Pradesh, Rajasthan, Hyderabad, Calcutta, Malabar, Madras, Travancore-Cochin and Mysore. For the last 20 years it is going to other States also and a Statewise distribution for the last 20 years is given in the following table:—

Distribution of Bombay Sea salt since 1935-36 to 1954-55

(Figures in lakhs of maunds)

Year.	Madhya Pradesh	Rajasthan	Hyderabad	Calcutta	Malabar.	Madras.	Tavancore-Cochin	Mysore	Uttar Pradesh	Bengal	Madhya Bharat	Panjab	Andhra	Bihar & Orissa	Vindhya Pradesh	Karachi	Delhi	Nepal	Bombay State	Total
1935-36	12.92	0.02	13.55	7.61	13.08	3.87	4.24	5.15	0.01	..	0.24	0.01	..	..	..	..	..	..	29.35	90.04
1936-37	13.37	0.01	15.84	5.34	13.99	3.70	2.92	5.71	0.04	..	0.12	..	..	..	..	..	..	..	31.50	92.55
1937-38	13.63	0.01	16.59	4.37	14.70	3.05	2.46	5.58	0.03	..	0.16	..	..	0.06	..	..	..	..	32.86	93.50
1938-39	11.53	0.01	15.02	4.83	12.02	2.78	1.59	4.78	0.01	..	0.12	..	..	..	..	..	..	..	27.96	80.75
1939-40	13.49	0.13	16.21	5.66	13.89	2.72	3.25	4.91	0.03	..	..	..	..	..	..	..	..	..	32.79	93.08
1940-41	14.45	0.11	16.56	5.09	12.97	2.57	2.50	3.72	0.02	..	0.12	..	..	..	0.01	..	..	..	33.69	91.81
1941-42	13.49	0.03	17.81	2.78	14.35	2.39	1.25	3.84	0.01	..	0.11	..	..	0.04	..	..	..	..	35.95	92.05
1942-43	26.51	1.23	22.57	10.19	14.00	3.66	1.75	7.33	1.28	..	0.47	..	..	1.00	..	0.03	0.01	..	39.95	129.98
1943-44	17.08	0.54	16.06	1.86	12.28	2.76	0.87	7.03	1.37	..	0.09	..	..	7.59	..	0.02	..	..	30.72	98.27
1944-45	15.49	0.02	21.24	0.24	10.07	4.50	1.41	8.42	0.98	..	0.03	..	..	5.80	..	0.01	..	..	36.21	104.07
1945-46	17.49	..	23.74	0.11	11.42	2.56	2.21	8.97	0.60	..	0.13	..	..	6.68	..	..	..	..	33.65	113.65
1946-47	11.14	..	14.61	2.33	7.55	1.80	1.78	5.50	0.42	..	0.14	..	..	6.38	..	..	..	..	39.82	85.67
1947-48	16.96	..	13.11	0.18	3.10	1.27	..	3.26	0.33	..	0.06	..	..	3.31	..	..	..	0.14	39.00	80.75
1948-49	20.57	..	21.80	0.08	..	12.02	..	3.96	1.11	..	0.13	(500)	..	3.47	..	0.02	..	0.03	40.87	104.20
1949-50	21.31	..	17.50	0.10	..	11.04	..	1.54	..	..	0.01	..	..	1.62	..	..	..	(500)	39.35	92.52
1950-51	23.73	..	21.18	..	..	18.42	0.03	2.64	0.56	..	(500)	..	..	1.86	.25	..	..	..	38.89	107.58
1951-52	19.59	..	21.06	..	..	17.82	0.03	2.56	1.73	0.26	0.14	..	..	2.82	1.75	..	..	..	36.43	104.48
1952-53	24.67	..	22.58	..	..	19.00	0.48	3.38	1.29	0.63	0.22	..	..	10.74	1.48	..	..	..	40.96	125.97
1953-54	23.51	..	21.49	..	..	17.03	0.27	2.82	0.11	0.68	0.32	..	..	0.58	13.84	1.63	0.02	..	40.42	123.21
1954-55	23.14	..	22.85	..	..	15.59	0.37	4.60	0.06	0.87	0.23	0.08	0.58	13.68	19.08	0.94	..	..	43.83	133.00
1955-56	26.02	..	23.06	..	..	13.14	0.16	4.15	0.09	0.62	0.21	0.04	1.68	20.46	1.04	..	0.02	..	45.46	136.18

Bombay salt is consumed over a large area. The average annual issues are about 100 to 110 lakh maunds. About two-thirds of the salt is consumed outside the Bombay State. Its success in outside markets in competition with other salt is due to the enterprising spirit of the Bombay traders who themselves market the salt in many cases.

The total issues are fairly constant, the chief outside markets being Madhya Pradesh 23 lakhs, Hyderabad 20 lakhs and Madras 15 lakh maunds. In the past, Bombay sea salt works had a flourishing export trade with Calcutta and Malabar districts in Madras. Up to the year 1874, on all salt exported to Malabar coast, an export duty of 3 pies per maund was levied in Bombay. But in 1874-75, when prepayment of duty on Bombay salt was introduced, an attempt was made by both Malabar and Travancore to obtain their supplies from Tinnevely, but it was found that no market could be got for Tuticorin salt except by forcing the sales and the authorities were in consequence compelled to return to Bombay for their supplies of salt. During the first Great war, shortage of salt affected Bombay's exports and the manufacturers found it difficult to regain their lost markets.

With the introduction of the zonal scheme in 1949, salt has to be supplied to the prescribed areas. Calcutta, Travancore and Cochin do not now fall within the purview of supplies from Bombay, but there is no restriction on movement of salt by sea route. The zonal scheme provides for annual supply of 120 lakh maunds of salt from Bombay. The manufacturers wish to clear their old salt before the new salt comes on the platform as once the new salt comes, there is no demand for the old salt.

(i) *Bombay-Calcutta salt trade.*—Salt used to be transported from Bombay sea salt works to Calcutta towards the end of the fair season in steamers which were late for the cotton trade from Bombay to Liverpool. The steamers went to Calcutta loaded with salt from Bombay and reached there just in time to catch the Calcutta export trade in produce which was brought down the flooded Ganges. Thus the freight on salt which was not worth-while to send except in ballast, was estimated just to pay the ship's port dues in Calcutta. The position has now changed, firstly because Calcutta requires fine grained white salt produced in Saurashtra and Kutch; secondly non-availability of ballast cargo; and thirdly the high rate of steamer freight, which has gone up from Rs. 5 to Rs. 25 per ton.

The question of transport of Bombay salt to Calcutta has engaged the attention of Government for a long time. In the first fifties of the last century, duty was required to be paid in Bombay. At Calcutta, a drawback was allowed at the Bombay rate up to the quantity manifested. No wastage allowance was allowed. Mr. Plowden in 1856, recommended export to Calcutta to be made free of duty. His argument was that Bengal was entitled to receive the duty at its own rate. Therefore, removals to Calcutta were made free from 1860. Discretionary authority was given to the Collector of Customs, Bombay, for the execution of bonds wherever he considered necessary. The rules of 1927, required a certificate showing the amount of salt to be supplied, to be produced before the officer-in-charge of the salt works, signed by the Collector of Customs, Bombay. Restrictions were laid down with regard to the tonnages of vessels transporting salt to guard against smuggling. The Transport of Salt Act, 1879, prescribed a minimum tonnage of 300. According to the Rules of 1927, the minimum size of the vessel was fixed at 1,000 tons. Removal of salt was also conditional upon the execution of a bond furnishing one surety or depositing Government Promissory Notes of a value sufficient to cover the duty plus possible

depreciation in value. The bond was cancelled and security returned on production of a certificate from the Collector of Customs, Calcutta, as to the landing of the salt and the payment of duty on wastage in excess of 5 per cent, if any.

(3) Foreign and Imported salt

Import of foreign salt having now been restricted by the Government of India, only small quantities of foreign table salt is imported under import licence. Salt is also imported into Bombay State from the Portuguese territory of Goa and Daman. Import of salt from Goa by sea is prohibited and annually about two and a half lakh maunds are imported by land *via* Castle Rock and Challa (Daman) Custom stations. Import of salt from Daman was prohibited till the year 1950, but this restriction was removed and salt to the extent of 50,000 maunds is now imported *via* Vapi Junction station. Salt imported from Goa is consumed in Dharwar and Belgaum districts and Daman salt in the southern Gujerat areas. As at present, there is no custom duty on imported salt, the salt from Portuguese territories are free of all levies. The import of Goa salt since 1908-09 is given in the statement below:—

Year	Quantity in lakh maunds	Year	Quantity in lakh maunds
1908-09	3.55	1932-33	1.81
1909-10	4.02	1933-34	1.07
1910-11	3.59	1934-35	1.45
1911-12	3.55	1935-36	1.82
1912-13	3.35	1936-37	2.24
1913-14	3.41	1937-38	1.69
1914-15	3.39	1938-39	2.09
1915-16	5.53	1939-40	2.43
1916-17	3.92	1940-41	2.62
1917-18	3.48	1941-42	2.59
1918-19	2.25	1942-43	4.22
1919-20	3.58	1943-44	2.52
1920-21	2.56	1944-45	2.59
1921-22	2.64	1945-46	2.70
1922-23	2.96	1946-47	2.27
1923-24	2.82	1947-48	11.68
1924-25	3.36	1948-49	11.88
1925-26	3.25	1949-50	2.36
1926-27	N.A.	1950-51	2.09
1927-28	2.07	1951-52	1.95
1928-29	3.30	1952-53	1.89
1929-30	2.81	1953-54	2.57
1930-31	2.68	1954-55	0.83
1931-32	2.27	1955-56	Nil

The import of Kathiawar salt has all along been prohibited into Bombay. In the past, importation of unexcised salt from foreign Indian ports (Saurashtra, Kutch and Janjira States) was restricted by the Transport of Salt Act under which salt not covered by a permit could not be carried along the West coast of India except by steamers or in sailing vessels of over 300 tons burthen. All salt produced in Saurashtra and Kutch in the licensed salt works was intended for the Calcutta market or exports outside India. With the abolition of duty on salt and with the Financial Integration of Part B and C States and the application of Central Excise and Salt Act 1944 to these areas from 1-4-50, the whole position changed radically and soon after the import of salt from Saurashtra and Kutch was permitted to Bombay. Such movement, though to Bombay proper is negligible, is still appreciable to the ports at Surat, Broach, Cochin, Calicut, etc. In addition salt from these salt works is now despatched under ordinary traffic to the consuming areas in the country subject to the availability of wagons.

Export of Salt

Salt has been permitted to be exported from Bombay State under 'free licensing' since 1953, but so far no salt has been exported from Bombay except for small consignments for sample and experimental purposes. This is because of the absence of natural facilities for exports by sea and the heavy cost of transport to the ports.

C.—PREVENTIVE MEASURES

(a) *Inland*.—During the days when salt duty was in existence, preventive posts were created for safeguarding revenue. A Preventive line known as the Northern Frontier Salt Preventive Line was established which ran from the Luni river in Jodhpur territory to the Bhogava river at the head of the Gulf of Cambay, a distance of 182 miles. At intervals of a mile there were guard houses occupied by four or five sepoys, and *sowars* were distributed along the line for patrolling. The object of the Preventive Line was to check smuggling of salt by land into the hinterland of India, from the natural deposits in the Rann, and from Saurashtra and Kutch territories. For the effective maintenance of the Preventive Line in Kathiawar, the Chifes concerned were required to admit officers of the Salt Department into villages and places and the political Agents were to assist the Salt Officers in every reasonable way. The officers of the Salt Department were empowered to apprehend and follow smugglers in Kathiawar and to seize suspected salt and carriages, animals and trappings used in the conveyance of salt. The States were asked to assist the officers of the Salt Department, taking part in the pursuit and catching of smugglers. The officers were competent to prosecute persons accused of smuggling before the local courts of the Chiefs or Agency. Storing of salt in excess of quantities required for local consumption in villages within 10 miles of the Preventive Line was prohibited. The Political Agent issued further Rules for the arrangement of storage and distribution of salt in Kathiawar along the Preventive frontier. In places where salt was naturally formed, only so much of it as was required for *bona fide* consumption in Kathiawar was allowed to be collected and stored. Salt in excess of this limit and not required for storage was destroyed. The States of Bajana, Vithalgad, Talsana, Jambu, Limbdi, Chuda and other minor States were made to subscribe to the provisions of the above order of the Political Agent, Kathiawar. The Government of India made special Rules for transport of salt from Bhavnagar to the State villages of Cotania and Sandhida

through the intervening district of Dhandhuka. They also framed similar Rules for the transport of salt from Limbdi to the State villages of Pachham, Fatehpur and Ratanpur through British territory.

(b) *Sea Factories*.—In the Bombay sea salt factories, there was a sentry post at each platform where salt was stored. In addition to this, there were special patrols whose duty was to move about constantly on the line outside the salt works and to watch the road and paths leading from them. Preventive Officers were also posted on a barge at the mouth of the creeks, inside which factories exist. They used to have patrol boat to move about along the creek to check smuggling.

With the abolition of duty in 1947, the Preventive posts have been done away with. The only control exercised now is that salt removed from the factories has to be accompanied by a permit issued by the Factory Officer and a 5 per cent check weightment is carried out at the various check weightment stations when salt is brought for local consumption or loading into wagons or in deep sea going vessels.

D.—LABOUR

None of the sea salt works in the Bombay State has been mechanised and all operations connected with the manufacture, production, collection storage and disposal of salt are conducted by manual labour. There are five categories of labour employed in this industry.

- (1) Workers doing mud work;
- (2) Workers doing manufacture of salt or salt production work;
- (3) Weightment workers, such as *dalas*, *hamals* and *shivnars*;
- (4) Boatmen and crew; and
- (5) Miscellaneous labour.

There is no uniformity of wages paid to them at several centres of salt manufacture. Both time and piece rates prevail. Time—monthly or seasonal—wages are paid to all agarias and *kharvis* in the Thana district. There being no uniformity in wage fixation in the various centres, disputes between them and the employers are arising every now and then.

Principally, there are three methods of recruitment:—

- (1) by direct negotiations between worker and employer;
- (2) contract through intermediary, viz. *khatedars*, patels or agents of employers; and
- (3) negotiations between trade union and employers association.

The third method is of recent origin. At Juchandra, Bhayandar and Belapur in Thana district and at Pen in Kolaba, unions have been organized since 1951.

Features of wage system

Dearness allowance is paid to workers who receive cash wages but this allowance has no relation at all to the actual cost of living. It is fixed for the whole season at the outset and is entered in the written contract. At Uran, dearness allowance is linked to cost of living index-numbers as decided by the award given by Shri Shinde.

Bonus.—Bonus payments made during the last three seasons are also fixed initially at the beginning of the season and form part of the total wage agreed upon between the workers and the employer.

Advances.—A system of advances prevails in the salt industry under which advances are given to the salt workers coming from outside the centre. These advances are known as “Bayana”, “Bhata” paid in lieu of cereals, condiments etc. and a third type of advance is “Kharchi” that is, amount to meet out-of-pocket expenses; and fourth expenditure on tobacco, tea and drinks.

Settlement of accounts

The accounts are settled at the end of season. One of the reasons is that the system of keeping balance of wages in hand acts as a deterrent to the worker recruited from outside and prevents them from running away from salt pan centre.

Payment in kind and other concessions

In Uran, payments are made in kind to *kharwa* and *khalasis*, who are supplied with articles of food such as rice, *dal*, condiments, firewood and kerosene. At all centres of the industry, *kharwas* are provided with huts, drinking water and in few cases cereals and fuel. They are also provided at Uran with implements. A pilot survey of the conditions of labour in salt pan industry conducted by the Directorate of Labour Information to the Government of Bombay, revealed that the average expenditure per mensem of a family of a local salt worker in the Thana district was found to be Rs. 56/4/4 and of the imported worker Rs. 23/8/3. The average monthly earning of a local worker's family during the salt season in the Thana district totalled about Rs. 86/12/-, whereas his counterparts viz. imported workers, the total earnings amounted to about Rs. 68/15/- for the season, while total off-season earnings of both averaged to Rs. 94/6/- plus 8 maunds of rice and Rs. 175/12/- plus 3 maunds of rice respectively.

Conditions of work

No hours are fixed in the salt industry mainly because the industry is dependent on climatic factors such as sunshine, heat, degree of evaporation etc. The day's work lasts between six and seven hours early in the season and increases gradually between ten and twelve hours when the season is in full swing. The Shinde award laid down, an eight hour a day, but this was applied to labour at Juchandra. The coolies have no fixed hours since their work consists of loading and unloading. So also the *kharwas*. Under Shinde award, it was laid down that grant of weekly holiday should be compulsory, but owing to ignorance of labour, this privilege is not availed of. Only three religious holidays are observed by the salt works, viz. Sankrant, Ramnavmi and Shimga.

Housing

No houses are provided by the salt works except temporary sheds which consist of a living room and a cookroom as the labour is mostly of a migratory nature.

Other amenities

The *kharwas* are provided with crockery and eating utensils and provision is made for food and fresh drinking water by the employer. The expenditure on this account is, however, deducted from the earnings.

Labour organisation

The following labour unions in Thana and Kolaba districts are at present functioning:—

- (1) Thana Mithagar Kamgar Sangh, Juchandra;
- (2) Mukadam and Munims Union, Juchandra;
- (3) Khalasis Union;
- (4) The Belapur Mithagar Kamgar Sangh, Belapur;
- (5) Uran Petha Mithagar Kamgar Sangh, Uran;
- (6) Pen Mithagar Kamgar Sangh, Vashi; and
- (7) Hamals Union, Bhayandar.

The first Union was formed in 1943 with a membership of 700 workers. It extended its activities so as to include salt workers at Mira Road, Bhayandar and Bassein Road. The present membership is estimated at 3,381. The second Union has 700 members, the third 1,500, the fourth 200, the fifth about 400 and the last two about 200 each.

Labour disputes in the salt pan industry were practically unknown till 1946 and even then if they occurred, they did not disorganise production to any extent. On 21-11-1946, conciliation proceedings were started, as a result of which Shri R. D. Shinde gave an award on 2nd May, 1948, which was extended to salt pan works in Bombay, Thana, Bassein Road, Ghatkopar, Bandra and Trombay. He passed another award in respect of disputes at Uran. Under the award in respect of Thana, the owners agreed to:—

- (i) pay Rs. 54 from the beginning of the season, (Rs. 30 basic, Rs. 19/8/- D. A. and Rs. 4/8/- bonus);
- (ii) a weekly holiday, etc.

According to the Uran Award, the salt pan owners agreed to keep the embankments and the turnings in the proper order, to repair inundations and to carry out all repairs, etc. The wages were fixed at Rs. 253 as seasonal wages for producing 1,400 maunds of salt.

Minimum Wages Act as applied to the salt workers in Bombay

In 1948, the Government of Bombay, by a Resolution dated 30th October, 1950, appointed a Committee under the Minimum Wages Act of 1948, with a retired Collector of Central Excise as Chairman to examine and recommend the rate of minimum wages that should be paid to the workers in the salt pan industry in this State. The Committee made their recommendations and the Government, in their Notification No. 2212/48-I, dated the 16th June, 1953, fixed the rate of minimum wages in respect of three different zones, to the two classes of employees of the salt pan industry as under:—

1 Class of employees	2 Rates		
	Zone I Rs. a. p.	Zone II Rs. a. p.	Zone III Rs. a. p.
Salt manufacturer	65 0 0 per month.	46 0 0 per month.	56 0 0 per month.
Mud Worker	2 6 0 per day.	2 6 0 per day.	2 6 0 per day.

CHAPTER VIII

MADRAS AND ANDHRA SALT SOURCES

Salt earth is available in Madras State (which formerly included Andhra also) in saline tracts from which earth salt is manufactured. Salt also forms spontaneously in swamps. In olden days salt was manufactured by solar evaporation as well as by boiling, spontaneous salt was extensively used for human consumption and earth salt for curing fish. Edible salt was also educated in the manufacture of salt-petre which for many years was carried on free from any restraint or regulation. This salt was consumed by the poorer classes.

A.—HISTORICAL

Salt manufacture has been going on in Madras from times immemorial. Madras has a very big coast line and the manufacture of marine salt was carried on along this line from Pundi in Srikakulam district of Andhra to Cochin in Travancore-Cochin State going round Cape Comorin. Salt was also manufactured on the Malabar Coast but as the climate, soil and brine of this Coast were unsuitable and produced only inferior quality salt, its manufacture was given up about 1824. In some districts such as Ramnad, Tanjore, Kistna and Nellore salt used to be produced in marshy swamps. This spontaneous formation was collected and used by the people. In addition to marine and swamp salts, earth salt of fairly good quality was manufactured in Bellary and Kurnool districts of Andhra. In 1802, the East India Company reserved to itself the exclusive right of manufacturing salt on the Coromandel Coast and production by private persons was made subject to Government control.

In 1805, Government also established monopoly for the sale of salt by regulation under which manufacturers were required to sell salt to Government at fixed rate. Government resold this to wholesale dealers after levying Excise duty and other charges. The quantity produced was called 'Dittam' and the price paid was called 'Kudivaram' and these were notified to manufacturers before the commencement of manufacturing season. This was known as the Monopoly System of manufacture. In 1807, this system was extended to Malabar Coast also.

The introduction of this system in Madras was the first step to realise revenue from salt by the East India Company. The Madras Salt Commission of 1876 stated in its report that the Salt revenue in Madras could hardly be said to have a history before the establishment of the Government monopoly. About 1808 the Salt Collectors were placed under the Board of Revenue. The sale of salt to any person other than the Government Collectors was made illegal. The Zamindars who manufactured or connived at clandestine manufacture of salt in their land were liable to punishment. Warehouses were opened by the Government in many parts of the country so as to enable people to purchase salt at Government prices.

This monopoly system continued without any change until 1853, when it was considered necessary to enquire into it for effecting possible improvements. Mr. Plowden was appointed as Salt Commissioner in Madras Presidency to examine the salt administration and suggest improvements. He stated in his report in 1856 that this system was designed to meet the expenses of new Judicial Establishment and it was favoured on the ground that the same amount of revenue could not be raised so cheaply

and with so little inconvenience to the community in any other manner. Mr. Plowden, however, recommended that "Excise System"—a system of licensing the production—should be introduced in suitable localities, as that would not affect the revenue derived in any way.

The imports of foreign salt into Madras was prohibited until 1818, when this embargo was withdrawn and an Import duty on salt at Rs. 3 per maund for entry into Madras ports was levied. This was subsequently reduced to Re.-/12/- under orders of the Court of Directors in 1851, but even then the imports were not encouraged, as this salt did not find favour with Madras consumers. The exporters of the foreign salt, however, raised an agitation against the Madras Monopoly System as they considered this hindered the imports of that salt in Madras Presidency and as an outcome of it the Madras Salt Commissioner was appointed in 1876. This Commissioner recommended: (i) Stringent and more active measures should be taken for the manufacture of salt in Madras as it had the natural advantage because of its geographical situation to make supplies of salt not only to other parts of India but also to adjacent countries e.g. Burma etc. and (ii) the Monopoly system should be replaced by the Excise system, (as suggested by Mr. Plowden) throughout the Madras Presidency.

The Government accepted the recommendations and particularly the conversion of Monopoly into Excise system, but the Collectors of the districts were advised to introduce it gradually. It was also decided to close the Monopoly factories where they could not be worked economically. The monopoly system of salt manufacture in Madras was thus brought to an end and gradually all the factories in Madras Presidency were converted into Excise system except at two places viz. Polavaram and Markanam (Korampallam Block). The production of these two factories constituted about 1 per cent of the total output. The necessity to continue these factories under monopoly system was that the production of Markanam factory was exclusively intended for supplies to French Government at Pondichery under 1837 Convention, while that of Polavaram went entirely to the Eastern States Agency in Orissa. However, these two monopoly factories underwent transformation into Modified Excise System from 1-4-1951.

The Excise System was subsequently changed into Modified Excise System under which the licensee, who ordinarily manufactures salt for his own sale may be required at any time before the commencement of the season to sell to the Government or reserve for sale to the Government; a portion not exceeding 50 per cent of his total production, at a fixed price.

B.—SYSTEM OF MANUFACTURE

Thus salt at present manufactured in Madras including Andhra (but excluding Orissa factories in Ganjam District which were earlier in Madras Presidency) falls under two distinct Systems:—

- (1) Excise System.
- (2) Modified Excise System.

(1) *Excise System*.—This system envisages (a) Manufacture of salt without any limit with regard to quantity and (b) Free sale to public direct after paying Excise duty (if any) and other charges. Government has a staff in the factory to exercise control over the process of manufacture to enable the producer to manufacture salt of a reasonable standard of chemical purity and also to help the licensees by arranging rail transport under priority

traffic as well as regularise the distribution to the consuming markets. The staff also looks after the maintenance of the common services to the licensees e.g. channels, drying grounds, platforms etc. and is responsible for collection of salt Cess and other dues which the licensees are made liable to pay, if any, in those factories. The licensee is bound by the conditions of his licence. He is responsible for the maintenance of channels, reservoirs, drying grounds, platforms, embankments. etc., in good repair and any infringement of the licence conditions which are very comprehensive may result in its cancellation.

(2) *Modified Excise System*.—The Excise System gradually replaced the Monopoly system and a large number of Monopoly factories was converted into Excise Factories. In 1926 the Excise System was further amended and the Modified Excise System was introduced in Madras Presidency under which the private manufacturers of salt who held licenses were required to sell a certain percentage, not exceeding 50% of their total production, to the Government during any time of the year and until fresh production started.

When the old Monopoly Factories were numerous, Government owned at the various centres of production stocks of salt which could be marketed any time. This had the sobering effect of keeping down the price of salt at a reasonable level. With the introduction of Excise System on a large scale the number of competing licensees became large and it became necessary under normal circumstances to put Government salt on the market in order to control prices. As a result of the introduction of Modified Excise System, the stocks acquired or held by the Government in different factories either by purchase from the licensees or produced in Monopoly factories still in existence, began to accumulate and subsequently deteriorate with the lapse of time. This stock was intended to serve the same purpose as the Monopoly salt i.e. to control the prices of salt in the markets in the interest of the consumers and to be supplied to such areas where scarcities due to natural or artificial reasons were apprehended. As, however, such exigencies were few and the stocks acquired or held by the Government were increasing amendments were made to the Modified Excise System. Instead of purchasing out-right the quantity reserved by the licensees for sale to the Government, the licensees were required to reserve only a percentage not exceeding 50% of their production for sale to Government, if necessary, at a fixed price at any time of the year and this was termed as 'Government Reserve'. If it was needed, the stock was released to the licensees at the end of the year or they were required to replace the same by new stocks from the fresh production in the subsequent year.

(3) *Excise Factories*.—(a) *Land Tenure*.—Many of the factories are old where the right to manufacture salt is hereditary and the manufacturers own the pans themselves. Where, however, the land is owned by the Central Government and the same has been leased out to individuals under Excise System, the right of inheritance and transfer or sub-lease has been made acceptable as in other cases where the land is owned by the manufacturers. The license in these cases however differs as it contains a 'no compensation' clause, which means that in case the Government acquire the land either during the tenure of the lease or otherwise no compensation for the land would be paid by the Government to the manufacturer or the original lessee. In the case of licensees who are masters of their pans or where the land in which salt is manufactured belongs to them, the license issued,

generally, contains a clause for payment of compensation, which means that if at any time the land is acquired by the Government or the manufacture is suppressed, the licensee will be paid compensation for the same.

No Excise license is issued now or has been issued after the introduction of the Modified Excise System except in cases of inheritance in the old factories. In all cases of new factories lately started or extension to existing factories where the land is owned by the licensee or by the Government, license under Modified Excise System alone is issued. Where the Central Government owns the land, the right to manufacture salt in the same is freely assigned or sold by public auction or settled by calling open tenders, as the case may be, for a period of 25 years. The allottee is issued a license to manufacture salt under the Modified Excise System and the lease concluded with him for the land is also under Modified Excise Terms. The license remains in force during the period of lease. In certain cases waste-lands within the factories or outside the same which are under Central Government control, are assigned to one or more licensees of the factory whose holdings are adjacent to the same and in such cases either no fee or a fee equivalent to the value of the land is charged from the assignees. The main purpose for this assignment is to help the licensee to expand his holdings and allow him to realign his works on modern scientific lines for manufacture of salt. The lease of the new extension is made concurrent with the period of the lease held originally by the licensee. The waste land owned by the Central Government in any factory is also assigned to the licensees for digging brine pits or for such other matters which are essentially linked to the manufacture of salt. The manufacture of salt is undertaken in accordance with the conditions of the license issued to the manufacturer and not otherwise.

(b) *Departmental Control*.—The excise system as opposed to monopoly system necessarily involved a certain amount of freedom from Government control both in the process of manufacture and in the character and quality of the production. Prior to 1927 the Department insisted on the observance of certain rules connected with the manufacture of salt both in monopoly and excise factories to ensure the production of pure and clean salt for the consumer. The important rules were:—

- (1) That the salt should not be scraped when the density of the brine in the pans exceeded 30°B,
- (2) That salt should not be scraped in less than one inch of brine,
- (3) That the bitterns should be eliminated after every 3rd or 4th scraping,
- (4) That salt should be scraped only in the mornings and evenings (to prevent deposits of magnesium salts).

From October 1927, the excise factories were no longer required to observe the above conditions, while in the case of Monopoly factories, condition (1) only was relaxed and the other three were retained. Besides the above, in all factories, excise or monopoly, a fixed proportion between the condensing and the crystallising areas was insisted upon, but from 1927 this was also given up. Thus in Excise factories all departmental supervision on the manufacture of salt practically ceased from 1927. However, to prevent the abuse of the privileges accorded to the excise manufacturers by relaxation of the above conditions of manufacture and to safeguard the interest of the consumer, certain conditions were insisted upon in the licence granted to the above manufacturers. They are:—

- (1) The licensee must commence and close manufacture within certain prescribed dates. These dates are to be fixed after due consideration

of the meteorological and other conditions influencing the manufacture in different factories. All encouragement, however, is to be afforded by the Department for prolonging the manufacturing season to give a larger yield.

- (2) The licensee must in any year in which notice shall have been given, manufacture salt with due diligence to the full capacity of his holding. The pans of such of the licensees, who do not work their pans for two consecutive seasons will be resumed by Government and the right to manufacture salt is either to be conferred on the adjacent pan-holders or put up to auction.
- (3) Certain regulations as to the method of manufacture must be obeyed.
- (4) Salt inferior to the standard laid down from time to time cannot be stored and is liable to be destroyed.
- (5) Salt must be stored under supervision and removed only with permission on payment of the prescribed charges and cess.
- (6) The licensee must pay such rent or assessment as may be fixed for the use of Government lands and buildings occupied by him.
- (7) The licensees must declare in his application for removal of salt, the price at which it has been sold.
- (8) The licensee must allow any approved officer of Government to inspect his works.
- (9) The licensee and his servants will have access to the place of manufacture and storage only during specified hours.

The above conditions which were imposed upon the manufacturers were of administrative nature. Generally the officers did not interfere in the methods of manufacture by the excise licensees with the result that these manufacturers laid out their works 'sans souci' with crystallising area, considerably in excess of the condensing area. This was done under the mistaken notion that a larger crystallising area will enable a richer harvest. The relaxation of the pre-1927 rules, which proved an invitation to the manufacturers to disregard all heed to either method of manufacture or quality of salt, was entirely against the interests of consumers and the progress of the salt industry in the State.

The introduction of Modified Excise System in place of Excise did not reimpose the conditions relaxed in the case of manufacturers under Excise licence, although under the new system licensee was required to manufacture salt of good quality only. The change-over from the system of Excise to Modified Excise, therefore, did not materially change the manufacturing system adopted by the licensees manufacturing salt for general sale. The result was that the quality was affected and until 1950 the production in Madras Region in many factories was of much inferior quality, namely, salt was produced containing only 88 to 90 per cent of sodium chloride content.

As the duty was not affected in any way, it appears no steps were taken by the Government to introduce quality control. The Salt Experts Committee in 1950 examined the position and recommended that this measure of relaxing the control over manufacture by the Government was detrimental to the interest of the consumers and suggested immediate steps be taken to reintroduce supervision over manufacture of salt throughout the country.

The advent of the new Salt set up under the Ministry of Industry and Supply consequent on the abolition of salt duty in 1947 brought about a radical change in the administration of the factories by the State Department. The disappearance of the Revenue function of the Department and the progressive and changed policy of the Government ushered in a new era in the Salt Industry when the licensees were given a much greater freedom than they enjoyed during the Duty days. The rules and regulations regarding the entry of licensees and their agents into pans and the manner and supervision of storage and sales, were all liberalised. Some restrictions and regulations were, however, imposed for improving the quality and quantity of salt and to lead the country into self-sufficiency. The following conditions are now therefore enforced on all new assignments in consonance with the above policy of the Department.

(1) All new leases are to be given on the Modified Excise conditions with a 'no compensation' clause.

(2) The lessees shall deliver a part of their production for disposal by Government the quantity being determined and paid for at such rates as may be fixed by the competent authority.

(3) The quantity determined by the preceding clause shall be termed 'Government Reserve'. In case the Government did not require this in any year, the whole or part of it will be released to the lessee.

(4) The premises leased shall be used by the lessee only for the purpose of manufacturing common and edible salt and its bye-products. The manufacture of the bye-products of salt shall be with the previous written sanction of the Salt Commissioner and shall be subject to such conditions as he may prescribe.

(5) The lessees shall not assign or sublet the lands or any part thereof or the rights or privileges granted to him without obtaining the previous consent in writing of the Salt Commissioner.

(6) The lessees shall complete the construction of the salt works within one year or such time as may be fixed by competent authority and according to plan approved by the Salt Department.

(7) The lessees shall dig and excavate channels, clear silt from the existing channels if necessary and construct reservoirs and condensers necessary for the supply of brine to the salt works.

(8) The salt manufactured in the premises shall not be sold by him at an ex-factory price higher than that which may be fixed from time to time by a competent authority.

(9) If so required by the Salt Commissioner or by any other authority empowered to do so, the lessees shall be bound to sell the salt produced by them to the person or persons so authorised in writing to make the purchase.

(10) The quality of salt manufactured shall be white and of the standard prescribed from time to time.

The attention of the officers in administering and controlling the industry in the new set up has been focussed on the production and its quality and also on exploring the possibilities of increasing the production by allowing new extensions and re-opening abandoned factories. The main duties of officers at the factories are to conduct brine tests and to give technical advice and assistance to the manufacturers to help them to produce

better quality and increased quantity of salt. Detailed instructions are issued by the Department for taking representative samples of salt every year which are analysed in Departmental laboratories. On the basis of analysis results sale of sub-standard salt for human consumption is prohibited and the manufacturers are given the option of utilising this salt for industrial purposes. The Salt Department has set up several laboratories for testing salt produced by the private manufacturers. It is the ultimate aim of the Department to have a laboratory at each of the salt producing centres, so that the quality of salt can be determined during the course of the production and the small manufacturers who produce salt more on a cottage scale can be constantly advised by the Departmental Officers how to improve their quality.

(c) *Cess on Excise Licensees.*—Prior to 1-4-1947 the Salt Duty was in vogue and the licensees were required to pay it on the clearances of their salt from the factories. In addition, licensees in Excise and Modified Excise factories were liable to pay annually to the Government under section 43 of the Madras Salt Act, 1889, so much of the charges for the establishment maintained at the factories for production and collection of revenue as were in excess of 5 per cent of the duty realised on the salt sold in these factories in the preceding year. This was called 'cess' as distinct from duty and it was raised to 8 per cent from 1-4-1933 and subsequently to 10 per cent from 1-4-1940. The rate of cess varied between 1 and 6 pies per maund of salt cleared and in exceptional cases it was as high as two annas a maund.

With effect from 1-4-40 in certain selected factories the cess accounts are maintained and settled at the end of each year for each licensee instead of the factory as a whole which is the system prevailing at all other factories. The chief object of the change is to avoid the accumulation of heavy arrears of cess dues.

Consequent on the abolition of the Salt Duty from 1-4-47 a uniform charge of 2 annas per maund was continued to be levied from that date on all salt removed from factories worked under the Excise and Modified Excise System *vide* Government of India, Finance Department, Revenue Division Notification No. 3/Salt/47, dated 29-3-47. The charge is intended to cover the cost of establishment. As there was some doubt as to the legality of the cess levied under Section 37 of the Central Excise and Salt Act, levy of this Cess was regularised by the Government by passing an act in the Parliament, called the Salt Cess Act, 1953. Under this Act the levy of this cess is in the nature of Excise duty on all salt manufactured in the country and the rate fixed is:—

- (a) in the case of salt manufactured in the private salt factory, at the rate of Re.-/2/- per standard maund; and
- (b) in the case of salt manufactured in the salt factory solely owned or solely worked by the Central Government, at the rate of Re.-/3/6 per standard maund.

The proceeds of the cess levied, under this Act, reduced by the cost of collection as determined by the Central Government shall be utilised on all or any of the following objects provided Parliament by appropriation made by law in this behalf, agree to the same:—

- (a) meeting the expenditure incurred in connection with the salt organisation maintained by the Central Government, and

- (b) meeting the cost of measures taken in connection with the manufacture, supply and distribution of salt by Union agencies and the regulation and control of the manufacture, supply and distribution of salt by other agencies, and in particular measures for:—
 - (i) the establishment and maintenance of research stations and model salt farms;
 - (ii) the establishment, maintenance and expansion of salt factories;
 - (iii) fixing the grades of salt;
 - (iv) promoting and encouraging co-operative effort among manufacturers of salt; and
 - (v) promoting the welfare of labour employed in the salt industry.

The Cess Act of 1953 also empowers the Government to exempt the manufacturers of salt from the payment of Cess either wholly or partly in respect of:—

- (a) such clearances from their factories which are exported out of India;
- (b) salt manufactured by any specified categories of small manufacturers; and
- (c) salt utilised in the manufacture of any other product of industry.

In addition to the above Cess the licensees of the Excise and Modified Excise factories in Madras are required to pay a special cess on all quantities of salt removed by them from their factories at such rates as may be fixed at the beginning of the financial year, which is intended to cover the interest on capital cost of works executed by Government on behalf of the licensees in the factories and the cost of any works, maintenance and repairs etc. executed by Government on behalf of licensees in the said factories annually. The rate of the special cess ranges from 1 pie to 2 annas per maund and is fixed for each factory every year taking into consideration the previous year's collection which is dependent on the sales of salt, the amount at the credit of the licensees from the recoveries on this account in the earlier year and the estimated amount of expenditure to be incurred in the factory on their account during the year.

C.—MANUFACTURE

(1) *Sources*.—Salt is manufactured in factories situated at various places along 800 miles of the Coromandel Coast which includes the States of Andhra and Madras. There are 61 factories covering an area of 16000 acres distributed along the sea board of the East Coast districts as shown below:—

ANDHRA.

SRIKAKULAM DISTRICT.—

Pundi.

Bhavanapadu.

Mulapeta.

Naupada.

Calingapatam.

VIZAGAPATAM DISTRICT.—

Konada.
 Bhimilipatam.
 Balacheruvu.
 Karasa
 Vedacheepurapallee.
 Pudimadaka.
 Polavaram.

EAST GODAVARI DISTRICT.—

Jaganaickpur.
 Pennuguduru.
 Guruzanapalli.

WEST GODAVARI DISTRICT.—

Turuputallu.

KISTNA DISTRICT.—

Pandraka.
 Manginapudi.

GUNTUR DISTRICT.—

Chinnaganjam North.
 Chinnaganjam South.
 Kanuparti.

NELLOR DISTRICT.—

Pakala.
 Pakala (Private).
 Iskapalli.
 Krishnapatam.
 Thummalapenta.
 Tada.

MADRAS.

CHINGLEPUT DISTRICT.—

Thillai.
 Voyalur.
 Attiput North.
 Attiput South.
 Vallur.
 Covelong.
 Cheyyur.
 Chunampet.

SOUTH ARCOT DISTRICT.—

Markanam.
 Cuddalore.
 Manambadi.

TANJORE DISTRICT.—

Neidavasal.
 Tranquebar.
 Negapatam.
 Vedaranyam.
 Thambikottai.
 Adirampatnam,
 Kattumavadi.

RAMNAD DISTRICT.—

Theethandathanam.
 Vattanam.
 Morekulam.
 Manakudy.

TINNEVELLY DISTRICT.—

Veppalodai.
 Arasadi.
 Karapad.
 Levingipuram.
 Sevandakulam.
 Urani.
 Urani Extension.
 Kalavasal (Private).
 Korampallam.
 Kayalpatnam.
 Keeranur.
 Kulasekarapatam.

TRAVANCORE-COCHIN STATE.

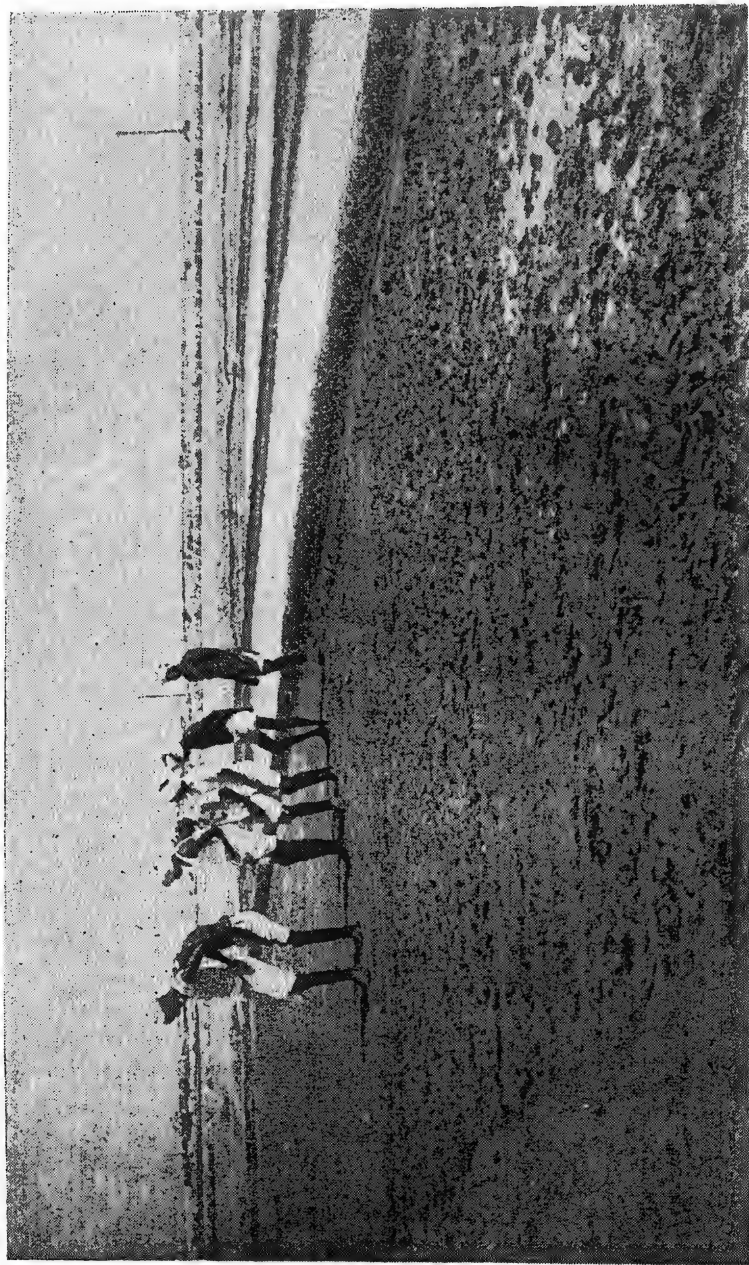
Thamarakulam (Old Allom group).
 Thamarakulam Extension.
 S.M.K.M. and S. S. Allom.
 S.M.G.N. and Puthallom.
 Rajakkamangalam.
 Colachel.
 S. C. T. M. Allom.
 Palkulam.
 Variyur.
 Thattarippu Odai
 Malipuram.

(2) *Season*.—The season of manufacture is different for Andhra and Madras factories and again it varies for different groups of factories as they are subject to the South-west or North-east monsoons.

The date of commencement and closure of the manufacture depends mainly on the weather i.e. the number of sun days, the start and close of the monsoon, the amount of rainfall etc. In the northern districts of Madras Region (i.e. Districts of Andhra) the rain-fall varies between 25-56 inches mostly during June and November. There is little or no rain in the later months of the year and the working season in these districts (i.e. in Andhra) generally starts in November and if there is no rain in December; salt is obtained in the pans in January. Manufacture work is topped in June except in the districts of Nellore, as rainfall during June and July in this district is scanty. Manufacture here continues till August or sometime even up to September. In the southern districts of Madras Region; Chingleput, South Arcot and Tanjore districts manufacture usually closes in September while in Ramnad and Tinnevely (Tuticorin) where the average rainfall is 23.81 inches, it continues up to October or even later. Thus the duration of manufacture is determined by the monsoon which varies considerably in volume and extent between north and south of Madras, the northern factories having a manufacturing season of barely 6 months while those in the south in the neighbourhood of Tuticorin are fortunate in having a manufacturing season of 10 months. Tuticorin, in fact possesses ideal conditions for salt manufacture. It has a dry climate, scanty rainfall and strong dry southern winds for several months in the year. The principal vocation of the agricultural class here is salt manufacture and except this area, manufacture of salt in Madras Region is in a large measure subsidiary to agriculture. Agricultural exigencies have an influence also on the date of commencement and close of the salt manufacturing season. The manufacture of salt can, therefore, be classed as a subsidiary employment to the agricultural labour which also helps them in meeting their necessities of life. As far as salt manufacture alone is concerned it is affected to a certain extent due to switch-over of the labour from salt to agriculture as in case the harvest is delayed or the monsoon starts early, the salt labour at once diverts its attention from salt to agriculture and becomes scarce and production of salt suffers.

(3) *Preparation of Salt Beds.*—The Salt pans in Andhra are for the most part laid out on two varieties of clay one black and greasy looking called carbonaceous clay which is very plastic and forms water-tight beds but which degenerates in course of time under the solvent influence of brine into a thick black mud injurious to the salt. It contains a little lime and is not so good a soil for salt works as the next variety, Ochereous clay. Red or Orchereous clay is also a species of mire, coloured by iron salts. Both of these clays split into irregular cubical fragments and turn pale in colour when dried and often exhibit an efflorescence of lime, salt or soda on the surface. The surface soil of many of the Madras salt works is a species of loam, a mixture of clay, a sand and salt dust which though permeable is capable of being worked up into water-tight compartments. The Salt Experts' Committee have stated that the soil in many of the salt works consists of black plastic clay which is ideal for the preparation of impervious hard beds.

The construction of all earth works for reservoirs and condensers is undertaken after the rains when the ground is still soft and plastic as otherwise the labour and the expense of cutting and breaking the hard clay will be enormous and this will add to the cost of production. All puddling, tamping and moulding are best done with brine as the salt in the brine appears to cement and consolidate the pan beds. Natural advantages have not been utilised in many of the factories in banking off or isolating an arm



Preliminary operations—tamping of beds



Condensing Stage (Irrigation)

of an estuary or a silted basin to form a reservoir of concentrated brine. The renewal of embankments and lay-out of supply channels are simultaneously taken up and all these preliminary operations take about a month.

It is essential to have perfectly impermeable and hard beds for the crystallising pans as quantity and quality, especially the latter, of the salt produced depend mostly upon the same. The following method for preparation of clay beds which has been handed down from generations past to the present labourers is strictly followed as it has been perfected by experience and is without doubt the best.

First, all vegetation is removed from the ground. If the soil is very hard and dry it is dug up to one foot and the clods are broken. Brine is then let in to make the earth soft which is then puddled by foot until dry so that the foot ceases to make an impression on it. It is then allowed to set and harden. When the surface of the bed shows signs of cracking, it is again irrigated with brine and process of puddling repeated. When the ground is about to be dry and hardened it is sanded and rammed and care is taken to prevent cracks. The bed when dry and hard after exposure, is ready for use and should be irrigated almost immediately as otherwise the cracks actually develop. For ramming the bed finally solid blocks of wood are used as hammers. The preparation takes two to three weeks.

The above procedure is applicable when the crystalliser is made for the first time with the virgin soil. It is not applied to the existing crystallisers. During rains almost all works get flooded and, unless there have been breaches and the consequent damage to, and dislocation of pans, all that is required to be done after the rain-water is drained out or the crystalliser dries up, is a bit of tamping the beds to make them ready for the next season.

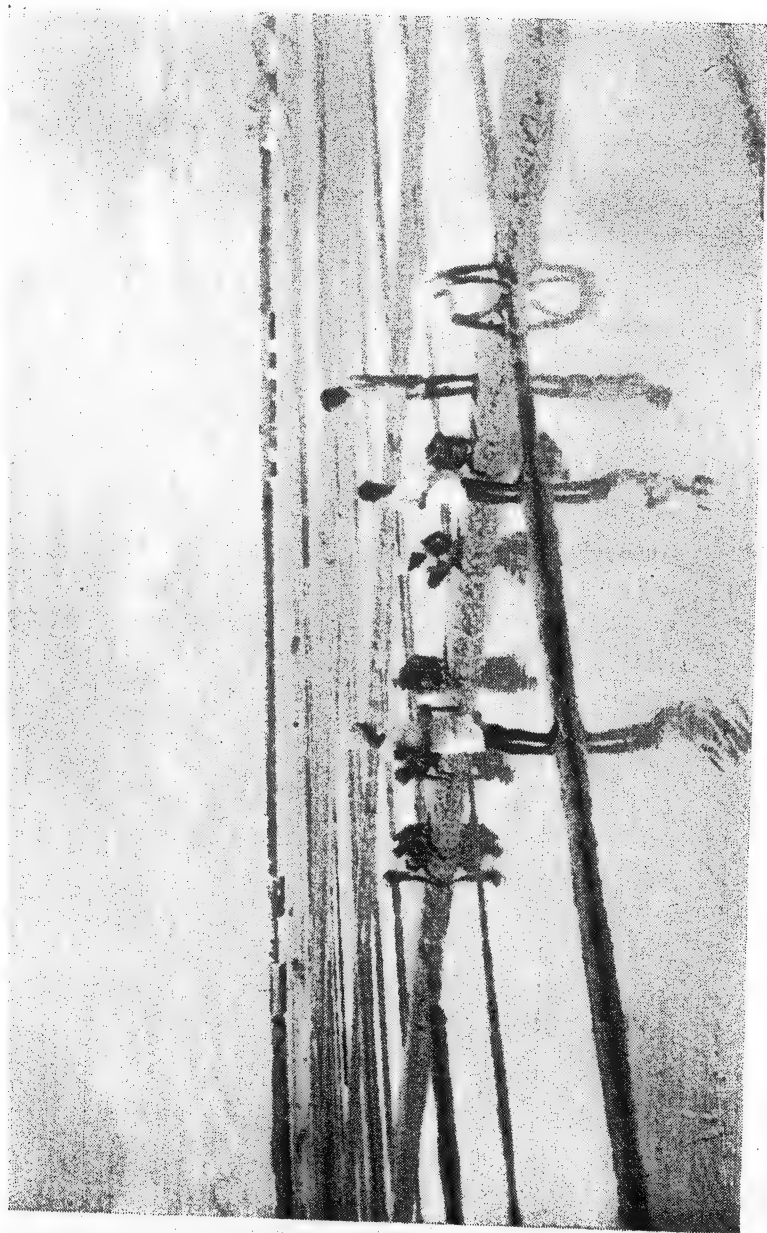
(4) Process.—Salt is manufactured in Madras by solar evaporation of brine obtained either from sea or sub-soil sources. The method of manufacture is practically the same in all factories. Some, however, evaporate sea brine, some back-waters, and some sub-soil brine of different densities varying from 3 degrees to 16 degrees Be'. Sea brine brought from tidal back-waters by channels is used in most factories. From the supply channels required quantity of brine is distributed through a net-work of small irrigation channels covering the whole area of the pans. In a few factories like Cheyur, the main supply channel which runs round the factory is also utilised for internal navigation for the transport of salt from the ridges to the storage platforms. In some factories like Covelong, there is a net-work of channels serving the dual purpose of supply of brine as well as internal transport. The supply of brine to the condensing areas is controlled by sluices in many instances while in other cases the brine from the channels is baled into them by means of *picottahs*—a contrivance which consists of a counterpoised long wooden beam with a leather bucket (sling basket) attached to one end. In some of the factories pumping engines are now being used by wealthier and enterprising licensee's. Where sea brine is used it is first let into a reservoir from which it flows by gravity into the condensers. In the case of pit brine, however, the brine, which is of a higher initial density is charged directly into the condensers. In the condenser the brine is allowed to concentrate from 12 to 15 degrees Be' before it is fed into crystallisers. This system is defective as calcium sulphate which separates out only from 17° to 24° Be' is not eliminated by this process and deposits in the crystallisers along with salt thus contaminating the same. Most of the works are laid out in such a manner that a condenser adjoins a crystalliser or a set of two or three crystallisers with one condenser only. The total area

of the condenser is almost the same as that of the crystallisers. In some places, its individual size varies depending upon the number of crystallisers it feeds. The condenser is generally known in the Madras salt works as the "Male" pan while the crystalliser is called the "Female" pan. The size of the crystalliser is small and varies from 30' x 15' to 15' x 10'. The process of evaporation is allowed to continue in these beds until the magnesium salts tend to crystallise at 32 degrees Be and before their formation, salt is scraped, when it forms a 1/7 to 1/4" crust, every third or fifth day depending on the season. The salt crystals are gathered by means of a flat board set at the end of a long handle like a rake. The labourer first breaks up the crust of salt, then scrapes the crystals into small heaps and finally drags them into one mass at the side of the crystalliser where they are left to drain. As the crust of salt is very thin, skill is utilised in scraping the same from the clay bed without contamination with mud. The salt afterwards is washed with brine to make it stainless. In many instances the pan beds are so small that all the above operations can be done from the foot-paths going round the pans and without getting into their beds. The salt in such cases when scraped is left on the pathways to drain off the mother liquor. The scraping is usually done in the hot afternoons when there is the least chance of the crop being adulterated with magnesium and sodium sulphates which are very soluble in warm brine. The bitterns are only occasionally eliminated and no separate channels are provided for them. They are usually thrown on the bunds of the crystallisers where they are allowed to dry up. Even though separate bitterns channels are provided in some works, the bitterns are seldom eliminated but allowed to soak into the soil and dry up. The dry residue of the bitterns is often taken out and used for ramming the ridges and the bunds of the crystallisers. This apparently contaminates the salt when produced in these crystallisers subsequently.

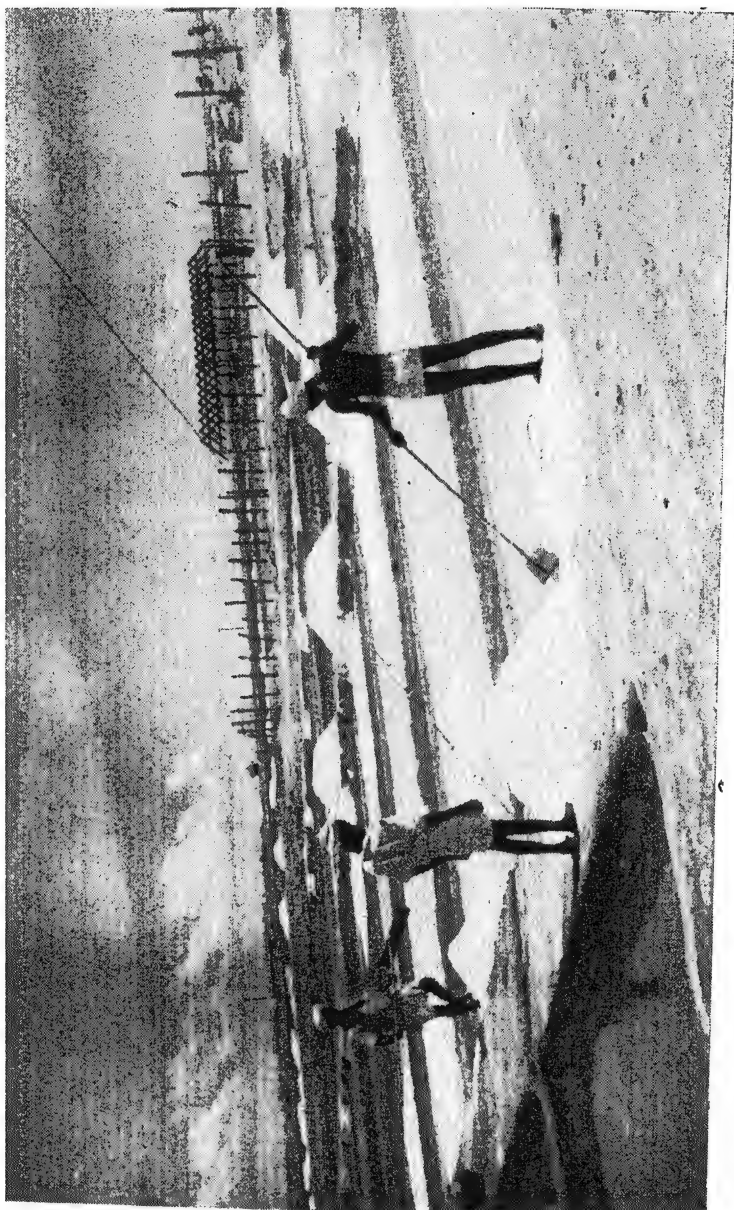
Two systems of salt cultivation, namely, "Single Irrigation" system and "Accretion" system, are in vogue in the Madras salt works, though the former, consequent on its multifarious advantages has completely replaced the latter system. The only factory—the monopoly block of Markanam factory—where the latter system was continued for a long time, has since switched over to the single irrigation system of manufacture as the factory was converted into a Modified Excise Factory in the year 1951.

Single Irrigation System.—In this system the salt bed is irrigated to a depth of about 1 inch or 1½ inches with saturated 25 degrees Be' brine which is evaporated until a layer of salt crystals generally a quarter of an inch thick has formed. The crystallising process takes two or three days when the salt is raked first with wooden scrapers within the mother liquor. It is then scraped and heaped on the pathway to drain. This is done to clean it from adherent mud. The bed is then irrigated with a first charge of brine. The irrigations and scrapings are repeated about every 3 days according to weather. The bitterns are ejected after every 4th or 5th scraping and the beds are retamped. This method is followed in all the factories in the Madras State.

The main advantage of this system is "quick returns". Convenience in working and the possibility of the minimum loss in the event of rain are other advantages. The salt is, however, light and liable to be dirty and impure. It also contains magnesium salts as impurities. As the scrapings are frequent, the beds get damaged and have got to be retamped. Moreover, high labour charges have got to be incurred on account of frequent collections of light crops. Another great disadvantage is the loss of evaporating period in the aggregate. The period of time, when scraping is started till the time when



Irrigation (Crystallising Stage)



Harvesting (scraping) of salt

crystallization commences in the re-charged pans is lost during each scraping. Taking this as the very minimum of 4 hours for each scraping, a period of 300 to 400 working hours is lost in a season of 10 months at Tuticorin.

Accretion System.—The accretion system followed in Madras is somewhat different from that at Sambhar Lake. Here thin sheets of brine, one inch or less depth are floated on the salt beds every four or five days. The number of irrigations is about six and they are evaporated one after another for a season of 2 months. The salt is deposited in strata one layer above the other and so the salt forms a loose cake above 3 inches thick. This is broken up in bed under the mother liquor and removed by hand. It is heaped upon the edges of the pans to drain and dry. The salt produced by this method is pure and free from dirt. As, however, the salt cake is made up of crystals formed at different times from successive evaporations and under different conditions of wind and temperature, it lacks cohesion and the loose lumps fall asunder. It does not bear carriage and is easily reduced to a fine powder. The disadvantage of the system is that a large ready crop may be spoilt by a single shower of rain.

The Salt Experts' Committee after visiting several factories in Madras observed that in spite of manufacture having been carried on for centuries, many of the Madras salt works are small, badly laid out and run inefficiently in primitive fashion. The only good factory was of the Mettur Chemicals Ltd., at Adirampatnam who have taken pains to relay their works on modern lines in order to produce salt of good quality and who have also erected a washery in their works, the only one in the whole State. If they had to sell their salt to the general public, perhaps they too would not have taken so much pains. As however, they wanted salt of high purity for their chemical works they had to do so in their own interest.

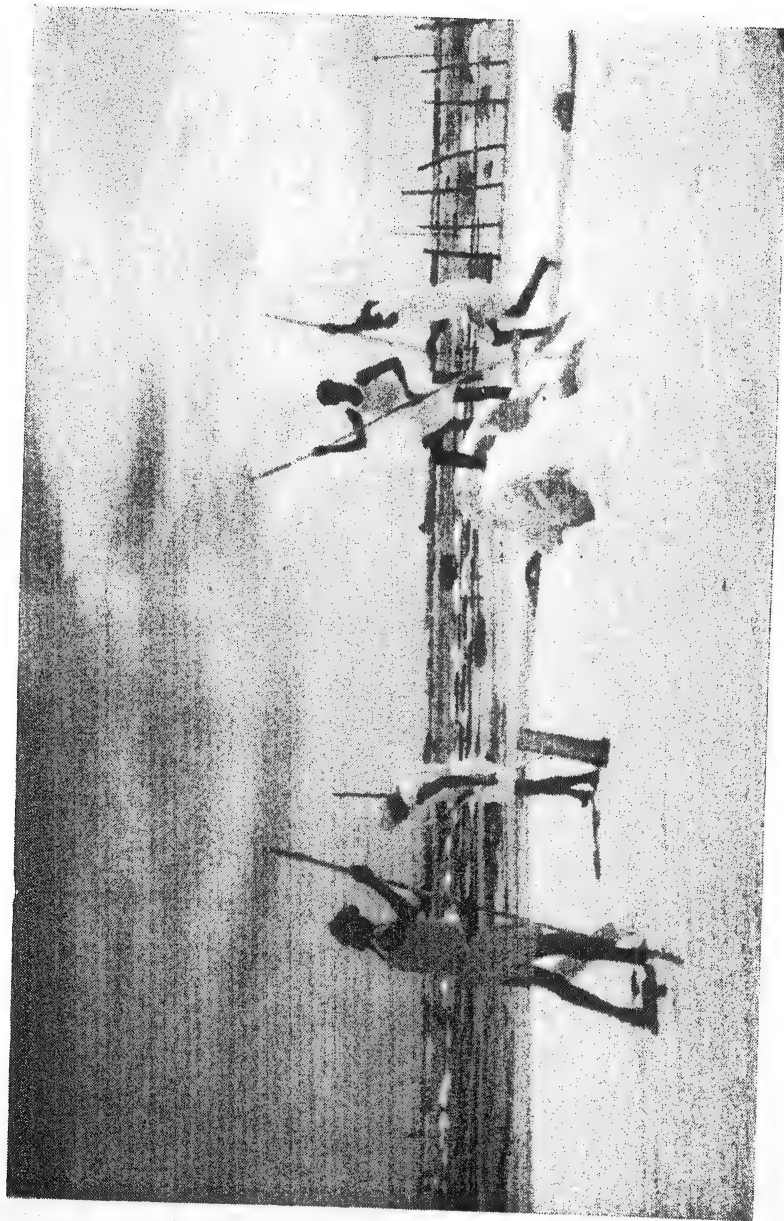
It has been noticed that in all the salt works the areas have not been properly distributed and apportioned to suit the initial density of brine and that the crystalliser area is always disproportionately large compared to the area of condensers. In many of the salt works like Pundi, Jagannaickpur and Pandraka in the northern districts, though the factories are owned by single licensees they are broken up into uneconomic units and farmed out to a number of labour groups by which the advantage of working the factory as a single unit is lost. There are also tiny factories like Tranquebar, Vepalodai and Arasadi with cultivable areas of less than 100 acres which fall under uneconomical units. The supply of brine gets depleted in some of the factories in the northern districts as the season advances and these factories are not able to draw brine from the sea owing to the parallel running of the Buckingham Canal to the coast of this area which is a navigation canal where the density of brine available is as low as 1 or 1.5 degree Be/. It has been reported that at Manmbady factory in Cuddalore Circle burrowing worms cause considerable loss of brine by percolation. Excepting a few pumps in some factories for the incoming brine and a few tipping wagons in 2 or 3 factories for transporting the salt to the platform, no mechanisation has been adopted in any of the salt works.

(5) *Weather conditions and their effect.*—The manufacture of salt depends mainly on the vagaries of weather. A long spell of dry and hot weather, as at Tuticorin, is ideal for the manufacture of salt. In the manufacture of salt concentration of brine by evaporation is the chief factor involved. Therefore, the factors which increase or decrease evaporation equally affect the salt manufacture. Factors which affect evaporation have already been indicated. Evaporation of brine increases with rise in temperature, wind velocity and surface of exposure and decreases progressively with the

rise of humidity of the surrounding air and the concentration of brine. Dust storms and rains may do extreme damage to salt already scraped and may also bring manufacture prematurely to a close. Dust storm besides spoiling the salt already scraped damage the beds. For instance in 1930 unseasonal rains interrupted manufacture very much in the northern division, e.g. the production which was 48·96 lakh maunds in 1929-30 fell to 31·69 lakh maunds in 1930-31. In Ennore factories, the manufacture proved a complete failure—about 1/2 lakh maunds being manufactured against a dittam of 18 lakh maunds. Cyclone too caused considerable damage to buildings etc. The Naupada factories were subject to occasional cyclonic weather as a result of which heavy damage was caused once in 1923 and again in 1943 and 1949. Recently in the end of 1955 again certain districts of Madras were severely hit by a heavy cyclone and rains. The worst affected districts were Ramnad and there are rain-gauges in most of the Madras salt works and rainfall statistics are compiled and sent to Meteorological Department periodically. The skilled labour in many of the Madras salt works are able to predict the vicissitudes of weather by studying change of winds, darkness of clouds and make necessary arrangements in time for protection of the works and the finished products.

(6) *Quality of salt.*—Madras salt varies widely in colour from white and grey-white to a muddy dark brown. The variation is caused mainly by the nature of soil or of the pans, though local methods of manufacture contribute to colour the salt to a certain extent by dust which is blown on the salt before it is dried and covered. The quality of salt is on the whole poor and on an average consists of not more than 92% of sodium chloride. Several factors contribute to the production of such impure varieties of salt. Prior to 1927 the Salt Department exercised fairly close control over the methods of manufacture by means of regular brine tests. Later on, this supervision of the Department was relaxed. The result was the production of salt of low purity.

The chief factor responsible for the poor quality of salt is the prevailing practice of sale of salt by measure. This has led to the manufacture of lighter varieties as in Bombay and Travancore. It yields a comparatively large bulk for weight. The traders like this salt as they buy it by weight from the manufacturers while sell the same by measures to the consumers, who are thus duped as they do not get salt worth the full value of their money. The traders are benefitted on the other hand and they always prefer this salt which encourages the manufacturers to produce more and more of it. Another factor which is also responsible for the impure quality of salt is the mistaken notion that a large yield could be obtained by increasing the area under crystallisers. In the Madras factories the ratio of the crystalliser to reservoir-cum-condenser varies from 1:5 to as low as 1:0·01 and these excessive areas under crystallisers give rise to production of salt containing impurities like gypsum, magnesium, sulphate, magnesium chloride besides insolubles. The presence of insolubles is invariably due to the fact that the manufacturers resort to frequent scrapings in the harvesting of their layers of salt following the single irrigation method. Charging of 1" to 1 1/2" at 17° Be/ will be reduced to about 1/2" at 24 or 25 degrees when they must do scraping getting very light salt but very impure at the same time. The irrigation of the weak brine much too shallow softens the clay beds also and as the clay beds floor is raked up at each scraping the salt crystals are often contaminated with mud. It is also asserted by a section of the trade that consumers in a few areas like Mysore and North Arcot Districts prefer brown or dark coloured salt to pure white variety and hence physical impurities or salt contaminated with mud is readily purchased by them. How far this preference is genuine, it is impossible



Drying of salt

to say; but even if sections of the public should in their ignorance prefer coloured salt they should be educated to shake off this prejudice and taught to appreciate the advantages of a clean and chemically pure white salt. Moreover, the way salt is used in these localities lends colour to the view that this preference for black salt is not a genuine one. They do not use salt in its dry state. They dissolve it in water, allow the mud to settle down, decant the pure solution of salt and use this solution in their cooking etc. The new salt set-up after the abolition of the Salt duty has brought in great improvements in the quality of salt produced in the Madras works in the recent years. A large number of manufacturers have realigned their holdings and switched on to the scientific system of manufacture under the guidance and persuasion of the Departmental staff. Samples of salt are drawn from all factories and are analysed as expeditiously as possible and sales banned in factories where the salt shows a percentage of sodium chloride less than that prescribed by the Government as the minimum standard of purity; which fixed was at 94% sodium chloride content in 1954 and 1955. The Indian Standards Institution, has, however, prescribed 96% sodium chloride as the minimum standard of edible salt but the Government has promised to achieve this standard by stages. It is also seen from the following analysis results that there has been a progressive increase in the number of factories producing better quality of salt:—

	1949	1950	1951	1952	1953	1954	1955
Below 92% .	54	32	18	21	23	32	20
Above 92% .	66	37	79	51	49	40	52

Now that the Madras Government has fallen in line with the other State Governments to enforce sale of salt by weight by legislation though by degrees, the salt industry in Madras can look forward to a promising future, which will not only raise the standard of salt for human consumption but will also help the manufacturers to produce salt fit for Bengal market.

D.—STORAGE

After the salt has been scraped from the pans it is put on the ridges of the crystallising beds to drain off the mother liquor used for preliminary drying. It is next carried by baskets to the drying ground and spread in the form of long ridges in the direction of the wind. Sometimes salt is also washed in baskets in the crystallising beds to remove impurities from it before it is taken to the drying ground. After a week or so, or even earlier if there is much demand, the salt is removed from the drying ground and dumped on the storage platform either for bulk or bag storage. In many of the factories the cost of transport charges of salt taken from the pans to the platforms is high owing to the distant location of the platforms. The advantages of the proximity of the platforms to the crystallising beds are being impressed upon the licensees and due attention is being given to this improvement in the layout of all the new works and in the realignment of old works.

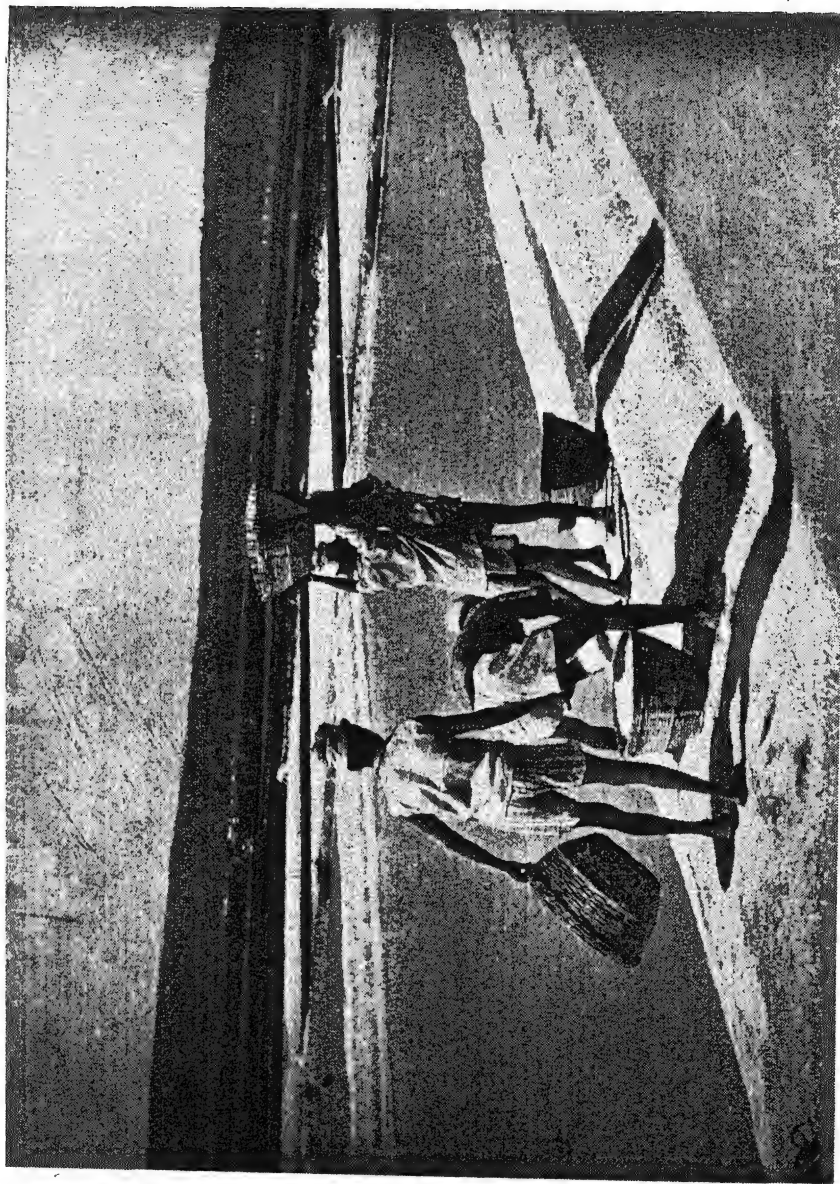
Consequent on the abolition of salt duty and the changed policy of Government, many of the rules for storage have now been relaxed. During the days when there was duty on salt, there were elaborate checks both on the quantity and quality of salt stored. All storage had to be done strictly

under the supervision of the Departmental Officers. After the abolition of the Duty from 1-4-47 the staff has been very greatly reduced and the enforcement of previous checks is not possible. The manufacturers may now at their option weigh the salt before storage for which hiring charges for the use of the G. P. Scale Machines are collected by the Department from the licensees at the end of the season. Alternatively, the salt may be removed to the place of storage in baskets of uniform size and weight determined by weighing a few baskets and calculating the weight of the whole heap which is also checked by the Factory Officers by finding out the cubical contents of the heaps. Storage is allowed to be made in 10 or 20 garce heaps (1,200-2,400 mds.) or in heaps containing quantities as prescribed by the competent authority. Manufacturers are also allowed to store their salt jointly. The heaps are made in the form of a wedge resting on rectangular base and having all the planes inclined at an angle of 45 degrees and in many salterns it is stored in triangular prismatic heaps with gable ends meeting at a right or an obtuse angle.

The heaps are covered by palmyrah leaves and some skill is required in placing thatching materials properly so as to ensure water-tight protection. The cost of thatching is borne by the licensees in all Excise and Modified Excise factories. No uncovered heaps are kept. The heaps are numbered and the licensees have to intimate the Officer-in-charge of the Factory all particulars regarding the storage of heaps through a storage petition which is checked and filed in the factory office in serial order and platform-wise to facilitate easy check.

Factory Officers may refuse to store salt when they consider its quality to be below the prescribed standard. Dirty, bad or wet salt is not generally allowed to be stored. Early commencement and storage of salt is always insisted upon. The coverings of heaps are renewed whenever necessary.

Storage of salt in bulk heaps is adopted in all factories but it was found that the process involved a considerable amount of handling and the salt was liable to be crushed. So the system of storage and sale in bags has been permitted under certain conditions since 1918 which concession is reviewed and extended year after year. Under this system salt is weighed direct from the drying ground into 2 or 2 1/2 maunds bags and the bags are stacked on the storage platform in approved spaces. Licensees who wish to avail of this system should apply to the Factory Officer for permission to store salt in bags with necessary particulars of quantity of salt proposed to be stored, space number and platform. The minimum quantity is 100 maunds and joint storage is also allowed. The licensees or merchants must themselves provide the necessary bags while the scale (cup-scale) for weighing this salt is hired out by the Department to the licensees. The hire charges due from the licensees are settled at the end of each month. Some of the major licensees credit lump sums towards hiring charges for the cup scale machines used in the weighment of salt. A running account is maintained in the factory office for these charges in respect of each licensee. No supervision is exercised at present by the Department during the weighment of the salt. The Factory Officer after the receipt of the storage petition from the licensee, verifies the heaps and makes necessary entries in the office-records. The retail merchants who sell salt by measure and not by weight also benefit under the Bag Storage System as the salt undergoes less handling and crushing and gives a greater number of measures per maund than heaped salt. The system allows the licensees to get ready cash which helps them to meet the expenditure on manufacturing operations during the season. Salt stored under this system must be cleared within 10 days of bagging



Removing of salt from ridges to platform

and all such bagged salt has to be removed before the end of the manufacturing season or restored in heaps in the usual manner. As a general practice, salt from the first scrapings is stored under the Bag Storage System and salt produced later in the season, when the output is more than the daily demand for sale, is stored in heaps and sold during the non-manufacturing season.

Storage in Madras Depot (since closed)

The Madras Salt Depot situated on the Buckingham Canal in the northern part of the city at Tondiarpet which was the storage ground for all salt of the Ennore factories was closed in 1936. This had the advantages of Railway sidings. The closure was necessitated by the vast accumulation of Government stocks at the Depot as well as the conversion of the factories in the Ennore Group into Modified Excise factories. The Depot had a storage capacity of over 30 lakh maunds.

E.—PRODUCTION

The following statement shows the quantity of salt manufactured and sold from 1935-36 to 1955-56:—

(In lakh maunds.)

Year	Manufactured	Sales (including duty free issues for industrial purposes)
1935-36	121.88	119.42
1936-37	95.66	120.86
1937-38	121.16	117.57
1938-39	129.15	111.33
1939-40	135.21	119.47
1940-41	103.48	131.91
1941-42	149.79	133.27
1942-43	166.81	167.18
1943-44	118.31	126.50
1944-45	148.06	131.49
1945-46	Not	available.
1946-47	131.74	139.84
1947-48	187.82	199.97
1948-49	213.07	171.94
1949-50	147.06	167.81
1950-51	200.75	192.43
1951-52	189.34	177.46
1952-53	191.56	187.33
1953-54	..	..
1954-55	120.97	119.15
1955-56	114.82	115.84

In the Madras Region all along the East coast there are about 61 Salt Factories (group of salt works) scattered in the Coast line of 800 miles. In 1893-94 the area under salt cultivation was about 13,800 acres. It rose to 16,000 acres in 1903-04, to 22,300 acres in 1928-29, 24,000 acres in 1934-35 and again came down to 16,000 acres in 1951-52. This 1951-52 figure excludes the acreage of Orissa factories, namely, 2,700 acres as Orissa was separated from Madras for purposes of salt in 1936-37. The total number of persons registered as holding salt pans is over 4,000 at present. The average annual production of all the factories in 1880 was about 70 lakh maunds only. The production has risen with the increasing population and now it varies from 174 to 190 lakh maunds per annum. The record output earlier was over 166 lakh maunds during 1918-19 as during that year there was decrease in imports of foreign salt into Calcutta due to the first World war and short-fall in salt production in the Northern India salt sources. Many works were limited then to a "Dittam" and as soon as these works reached their limit they used to stop work. But these restrictions were lifted when the Monopoly factories were replaced by Excise and Modified Excise factories. The industry has, however, been subject to several changes in Government policy but apparently it gained fillip when the Monopoly system was replaced by Excise and Modified Excise systems.

The right of Government to purchase salt from the licensees of Modified Excise factories is exercised to a limited extent only. In 1931-32 Government purchased about 1,300 maunds only under this right. In 1932-33, 1933-34 and 1934-35, Government did not consider it necessary to exercise this right as the prices charged by the licensees were reasonable. Generally there is a big stock varying from 35 to 50 lakh maunds in Madras factories as carry-over from the previous year's production. Under the Modified Excise system a certain percentage of Government reserve has been insisted on from the manufacturers, *i.e.* they are required to reserve a certain percentage (now 10%) of their production for purchase by the Government, if necessary, at a reasonable rate. This helps the Government to meet an emergency at any time and to prevent salt famine.

F.—COST OF PRODUCTION

In the beginning, in calculating the cost of production of Government salt the establishment charges were not included. From 1905, it was decided that the Establishment charges in excess of 5% of the duty on the salt sold in the previous year should be included. This was followed till 1927-28 when the limit was fixed at 10% which was subsequently reduced to 8%. The cost of production varied from factory to factory worked under the Monopoly system according to local conditions. In 1903-04 it ranged from 1 anna 8 pies to 5 annas 2 pies per maund, in 1923-24 from Re. 0-2-10 to 0-5-6 and in 1936-37 it varied from 3 to 6 annas per maund. The average cost of production in the Government factories worked out at Re. 0-5-6 a maund at Polavaram and at Re. 0-5-7 a maund at Karambalam Monopoly block of the Markanam factory during 1945-46. These figures include the land and village cess, Kudivaram (*i.e.* payments to the manufacturers for their salt) interest on capital cost of works at 5 1/2%, repairs to the works connected with the manufacture and storage, one third of Establishment charges and pensionary charges for the same, storage charges and other miscellaneous expenditure connected with manufacture.

The cost of production of salt in the Excise and Modified Excise factories of this State varies from Re. 0-3-2 per maund to Rs. 1-5-0 per maund in the recent years. Some of the factories have given the break-up of cost, of production as shown below:—

Break-up of Cost of Production in Madras Factories

	Per ton			Per ton		
	Rs.	As.	Ps.	Rs.	As.	Ps.
(a) Cost of pumping and labour	7-7-0	to	13-1-8			
(b) Maintenance including repairs and betterment	0-3-0	to	3-3-8			
(c) Supervision and over-head	0-5-6	to	1-13-4			
(d) Rent, rate and taxes	0-1-0	to	0-14-2			
(e) Depreciation	0-3-0	to	0-5-3			
(f) Miscellaneous charges	0-4-6	to	3-2-4			

There is a large variation in the statement furnished by different factories in the figures of cost of manufacture as well as break-up of cost. Many of the factories do not maintain detailed accounts to arrive at an accurate break-up of cost and the figures furnished above are only approximate. Many factories in the State pay for the salt produced on a contract basis and they cannot give a break-up of cost because the only direct expenditure that the management incurs is on repairs, maintenance and up-keep of plant and machinery. Little difference in the cost of production is noticed between the larger and smaller works in the factories north of Madras and is mainly due to the fact that the so-called larger works are in practice subdivided into small units each worked more or less independently by a gang of labourers. Even the few licensees owning larger works have fragmented their holdings into small uneconomic units. Considerable reduction in the cost of production can be brought about if the licensees conduct the manufacturing operations by employing labour for each item of work instead of leaving the entire operations to labour gangs on contract basis and if the minor licensees work the pans with common reservoirs and condensers. With the abolition of duty on salt from 1-4-47, the establishment charges are recovered by the levy of a charge of Re. 0-2-0 per maund on all salt removed from the factories. The exports of salt outside the country are, however, not subject to this cess. The cost of production works out to Re.-/9/- on an average and the F.O.R. cost of salt delivered packed at the nearest Railway station thus works out to Rs.1/14/6 per maund, as per the following details:—

	Per ton		
	Rs.	As.	Ps.
Cost of gunny bags	23-13-0		
Cost of filing & weighing	2-8-10		
Transport to Railway siding or station	5-9-8		
Handling charges	1-11-3		
Case	3-6-6		

and allowing for a margin of a profit of Rs. 3/6/6 per ton (0/2/0 per maund) to the manufacturer, the selling price would be Rs. 55/3/9 per ton (Rs. 2/0/6 per maund) which is on the high side for the quality of salt manufactured in Madras.

G.—SYSTEM OF SALES AND ISSUES

In Madras each factory is securely enclosed, and was guarded by a force of armed peons during the Duty days. Consequent on the disappearance of the Revenue function of the Department, since the abolition of the salt Duty in 1947, there has been a considerable reduction in the Watch and Ward staff with the result that good quantity of salt from the pans and platforms and in a few factories Government properties are also being stealthily removed due to the inadequate guarding arrangements. The licensees also have not been active in this direction in putting up their own guards for the protection of their salt. Each factory in Madras is furnished with standard maund weights and three types of weighing machines are supplied for use on each selling platform. From the year 1949 for the maintenance of the weighing machines, hire charges are collected from the licensees at 4 annas per every 300 maunds or a fraction thereof. Of the three machines, one is used for weighing salt in bulk prior to storage; another for issues and third for accurate checkweighment of bags before removal from the factory. There are elaborate rules for using and testing the machines and carrying out checkweighments and the technical staff at the Departmental Workshop at Tondiarpet, Madras are deputed every year to visit all the factories to examine these machines and to set right any defect found in them.

The procedure for the removal of salt from the factories in Madras Region has been described in detail in the Madras Salt Manual and the same is at present in force. The licensee or the manufacturer puts in an application (in Form E.11) to the Factory Officer for removal of salt from the factory after depositing the "Cess" (according to the Salt Cess Act, 1953) and the special cess, if any, fixed for that factory, in a district or a taluq Treasury under an authorised receipt of payment on account of Central Government (the salt treasuries have been abolished from November 1948). The price of salt is paid by the buyer to the licensee or the owner of the salt direct. The correct price paid by the buyer to the licensee is not mentioned in this application for removal but the manufacturers or the licensees generally quote the ex-factory price below the maximum fixed by the Madras Government for the purpose. The salt is removed in bags and each bag will be assumed to contain exactly 2 maunds or 2 1/2 maunds of salt as the case may be and Cess etc. paid by the manufacturer on the above basis. The Factory Officer on receipt of the applications permits the removals after verification of details furnished in the application and the quantity in stock of the applicant in the heaps specified. On receipt of these permits the applicant arranges for weighment of the bags intended to be cleared and stack them separately. In the case of bag storage *i.e.* where the salt has not been entered in the stock of the factory earlier but is allowed to be cleared directly from the drying-ground or the platform before storage, a storage application for the bags is also submitted by the licensee or the manufacturer along with the E. 11 application to the Factory Officer. In respect of delivery of salt from the bulk storage *i.e.* heaps, the applicant arranges for weighment without departmental supervision (in Monopoly factories weighment and delivery used to be done in the presence of a Petty Officer). After weighment the bags are removed to the gate for clearance where 5% of the bags are check-weighed by the Factory Officer on a standard platform machine and $\pm 2\%$ difference in weight is taken as normal. Prior to 1947 *i.e.* in Duty days, 15% check-weighment was in practice but this has been reduced to 5% after the abolition of Duty. The



Check weighment

check-weighment Officer after check weighment issues orders for removal of bags from the factory in the presence of a Petty Officer or a senior peon. All handling and weighing charges are borne by the licensees.

Weighments of salt in the Madras Region factories start early as check-weighments have got to be completed by a specified hour, so that all consignments check-weighed are removed from the platform before sunset. Hours of storage, sales and check-weighment are fixed by the competent authority to suit the local conditions in consultation with the trade and without upsetting the normal practice. Consignments are weighed out in the numerical order of delivery orders. The licensees as far as possible try to sell their old stocks first before the new stocks, in order to minimise wastages. Salt lying in the platform for more than five years usually deteriorates to such an extent that it gets unfit for human consumption and such stocks are not allowed sales by the Factory Officer. They are generally thrown back into the condensers.

The salt credit system which was in force for many years and under which removal of salt by merchants and licensees was allowed on deposit of securities in six months was first modified and later abolished from 1st April 1932.

From the year 1949 the Department have permitted producers and dealers of salt to open account currents with the Regional Officer under which advance payment as determined by the said officer towards charges and Cess in respect of removal of salt from the factories for any particular licensee is deposited in a Government Treasury. Such accounts are settled at intervals of not exceeding one month. The account holder has to make periodically a deposit therein sufficient in the opinion of the local officer to cover the charges on the salt intended to be removed from the Factory. When the opening of an account current is authorised the concerned factory Officer is instructed to allow salt to be cleared from the factory until they receive instructions *au contraire* from the Regional Officer. The Factory Officer also maintains a personal ledger account to watch the clearances applied for, by the account holder and will not ordinarily allow clearance beyond the credit available.

Selling Price

Under the Monopoly system the private manufacturers, who were paid Kudivaram at different rates varying with locality, could sell salt only to Government. The salt was resold by Government to traders at a price calculated to cover the purchase money paid to the manufacturers and the expense of storage, transport, etc. For many years the selling price was reduced to an average for the whole State. This price was independent of duty and was at first 2 annas and then raised to 3 annas which rate continued till 1905 till the introduction of auction sales in the factories. During 1919, the policy of the Government in regard to the sale of Government salt was defined as follows:

1. The price of salt should be kept as low as possible in the interests of the public; the preliminary object of Government stocks is to control the prices charged by the trade;
2. When stocks are short, Government salt should be sold by auction;
3. Government sales should be so restricted as always to keep a substantial Government Reserve in stock as widely distributed over the State as possible;

The price of salt of monopoly factories and Excise factories was Re. -/4/11 and Re. -/3/5 per maund respectively in 1924-25; it rose to Re. -/6/3 and Re. -/7/11 in 1925-26 and came down to Re. -/3/3 and Re. -/2/11 per maund in 1934-35. The prices from 1935-36 onwards are given below:—

In Excise factories the price depends on supply and demand. When there is a successful manufacturing season and a large output, competition is naturally keen and price falls. If manufacture fails at some places the price

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risers. This was the case in 1930-31 when stocks were reduced owing to bad manufacturing season and so the price rose. The policy of the Government, however, is to keep the price as low as possible and Government stocks are kept with this object. Under Madras Government Order No. MS 1098 (Food Department) dated 4-10-47 issued under the Essential Supplies (Temporary Powers) Act, 1946, ex-factory wholesale and retail prices of salt in that State are regulated. The Collector of each district by a special notification was allowed to fix the ex-factory, wholesale and retail selling prices of salt every year taking into consideration the cost of production and the connected handling, transport and other charges to stem down the steeping prices of salt during artificial scarcities and the defaulters were liable for penalty, subsequently in 1951 the fixation of wholesale and retail prices was withdrawn and only the ex-factory price was allowed to be fixed under the above order.

The ex-factory price of salt in Madras salt works on an average works out to Rs. 1/2/5 per maund and the wholesale prices in the consuming centres vary from Rs. 1/8/- to Rs. 3/- per maund. The present ex-factory prices of salt in different districts in the State (Madras Government Order No. M.S. No. 1098 (Food Department) dated 4-10-47) are as follows:—

Districts	Maximum ex-factory wholesale price of salt per maund, excluding charges payable under the Government of India notification in the Finance Department (Revenue Division) No. 3-salt, dated 29-3-47 and charges for gunny bage.		
	Rs.	as.	ps.
Vishakhapatnam	0	15	0
East Goavari	0	12	0
Guntur	0	12	0
Kistna	0	12	0
Nellore	0	12	0
Chingleput	0	12	0
South Arcot	0	12	0
Tanjore	0	12	0
Ramnad	0	12	0
Tinnevely	0	12	0

As the salt sources are situated in the maritime districts and as the bulk of salt has to be transported inland it is inevitable that the cost at places which are at a considerable distance from the production centres are high owing to the addition of freight. Another factor responsible for the higher price is the cost of gunny bags which is higher than the price of salt packed therein. When the smaller works in different producing centres are combined into larger or Co-operative units and efficient methods of manufacture are adopted and the works are scientifically laid out and mechanisation introduced, appreciable reduction in the cost of manufacture and selling prices could be brought. The third factor which increases the price of salt at the consuming markets is the freight on salt paid either for rail or sea transport. The railway-freight has now gone up and the special rates granted earlier by the Railway authorities from station to station have been withdrawn. The sea-freight for salt from different sources to the same destination (Calcutta, etc. is different. The freight from East-coast or Madras

Region to Calcutta is more than the freight from West-coast to Calcutta although the distance to be covered by the Madras Region salt to Calcutta is less than half of that from West-coast to Calcutta. If the freight structure is revised, salt can be made available to the consumer at a cheaper rate. Further, because of the absence of railway sidings or suitable water-ways for transport of salt from different factories to the Railway stations or sea-ports the cost of salt increases. If suitable railway sidings are constructed in different factories and canals are opened wherever possible to remove the production of factories which are not connected otherwise by rail, it will reduce the cost of transport considerably than at present.

Retail sale of salt in Madras is by measure. The question whether retail sale of salt by weight should be made compulsory by law was examined by the Salt Committee of 1903. They were of the opinion that it would not be advisable to interfere with the established system and hence salt continued to be sold by measure. The Madras Government in view of the Salt Experts Committee's and Salt Advisory Committee's recommendations have since consented to enforce sale of salt by weight by legislation which is bound to have a salutary influence over the quality of salt produced in Madras salt works. The Madras Government by their notification issued in Gazette Extraordinary No. 1908 dated 10-12-52 prohibiting the sale of salt by measure with effect from 1-1-53.

H.—DISTRIBUTION

The distribution of Madras salt is shown in the following table:—

Year	Madras Presi- dency	Mysore and Coorg	Travan- core	Cochin	Bihar	Orissa	Central Province	Nizam's Domi- nion	Bengal Rail	Sea.
(Figures in lakh Mds.)										
1935-36 .	96.99	0.88	0.16	0.41	..	9.10	3.51	1.71	*2.25	..
1936-37 .	99.11	0.88	0.19	0.60	..	9.60	2.89	1.90	*0.33	..
1937-38 .	96.51	1.34	0.135	0.494	..	6.38	3.20	1.52	*0.84	..
1938-39 .	90.47	1.24	0.50		..	10.52	3.20	1.51	0.03	..
1939-40 .	92.89	1.04	0.50		..	11.20	3.83	1.98	3.53	..
1940-41 .	105.87	..	0.52		..	10.31	3.60	2.025	†4.96	..
1941-42 .	100.71	..	1.15		..	12.86	10.43	2.46	0.13	..
1942-43 .					Not Available.					
1943-44 .	94.61	..	0.37		..	7.14	0.90	1.81	4.82	..
1944-45 .	105.58	1.39			..	6.15	1.05	0.27	5.32	..
1945-46 .					Not available.					
1946-47 .	98.03	9.42	0.04		..	11.84	1.05	10.58	4.96	..
1947-48 .	143.18	14.74			..	15.00	4.33	18.08	0.55	..
1948-49 .	142.31	2.67	0.00972		..	8.49	2.26	2.83	1.11	..
1949-50 .	123.62	7.85	0.04		..	10.29	3.09	5.88	0.024	11.58
1950-51 .	115.78	7.71	20.80		2.07	10.67	2.45	6.08	46	18.88
1951-52	114.80	5.15	16.66		0.42	9.93	2.55	6.17	..	21.57
1952-53 .	110.60	6.96	17.30		0.85	10.90	1.51	7.75	..	26.86
1953-54 .	74.64	7.20	19.45		4.89	14.11	1.55	7.38	..	19.87
1954 .	74.51	7.07	2.73		3.37	12.31	2.18	8.14	..	27.15

*Separate figures for rail and sea not available. This includes salt sent from Ganjam.

†Seems to be excluding Ganjam Salt if any sent to Calcutta. Excluding Nagercoil Circle.

Year	French Govt.	Industrial concerns	Fish curing	Japan	Maldiv Islands	Anjenge & Tangasseri
1935-36	0.52	1.08	2.83	..	..	..
1936-37	0.47	1.36	2.44	..	..	..
1937-38	0.60	1.31	1.89	..	..	..
1938-39	0.52	1.34	1.99	..	..	0.006
1939-40	0.66	1.64	2.17	..	..	0.027
1940-41	0.57*	1.82	2.20	..	..	0.034
1941-42	0.61	2.38	2.53	..	..	0.021
1942-43 . . . .	..	.. Not available.				
1943-44	0.93	2.18	3.65	..	..	0.019
1944-45	1.19	2.10	4.04	..	..	..
1945-46 . . . .	..	.. Not available.				
1946-47	0.57	..	3.33	..	..	..
1947-48	0.69	..	3.39	..	..	..
1948-49	0.31	..	1.38	1.60	0.03	..
1949-50	0.34	..	0.86	..	..	..
1950-51	0.39	1.26	2.50	..	0.056	..
1951-52	0.43	5.15	..	0.02	0.5	..
1952-53	0.87	3.97	..	1.21	0.8	..
*1953-54	0.12	3.28	..	..	..	..
1954-55	0.02	..	..	..	0.09	..

* This seems to be excluding the salt purchased from the lessees and sold to French Govt. if any.

The issues to the State show considerable variations the lowest figure being 81.94 lakhs in 1915-16 and the highest 143 lakhs in 1947-48. The variation noticed is due to the growing population in the State, the development of industries consuming salt as a raw material and the greater *per capita* consumption of salt by the population. The low issues in 1915-16 were due to the restrictions placed on the sales of Government salt on account of low stocks, the season having been unfavourable and also Government's restrictions on issues of private licensed salt. The demand from Mysore has remained fairly constant and Madras salt was holding its own there against Bombay salt even before the introduction of Zonal distribution. In Hyderabad there is no real competition, Bombay supplying the western parts and Madras the eastern. Export by rail to Madhya Pradesh and Orissa and Bengal increased during War years. The issues to Orissa show a marked increase since 1927-28 and this is due to the enterprise shown by the capitalist licensees at Ganjam and Naupada during the previous years and due to Zonal distribution in the recent years. The issues to Travancore in the recent years have been reduced considerably due to the extended local manufacture in the State.

The salt produced in the Madras factories meets almost the entire requirement of the Madras State and Coorg and 40% of the requirements of Orissa, 18% of Madhya Pradesh and Berar, 44% of Hyderabad and 56% of Mysore. Bombay meets about 10% of the requirements of Madras, by supplying salt to the western districts of the State close to Bombay sources.

Under the Zonal distribution of salt drawn up by the Salt Department for rational and equitable distribution of salt throughout the country in collaboration with the Ministry of Railways, Madras factories have been grouped into 2 zones and a separate area has been allotted to each zone for marketing its salt. Each loading station adjoining a factory has been allotted a certain number of wagons on the basis of its production capacity. The consuming areas for each zone have been allotted with due reference to the potential capacities of the factories lying in the Zone and the estimated requirement of salt for consumption in those areas. Statistics regarding the movement of salt under this scheme are periodically gathered and compiled in all offices to assess the salt consumption and stocks in the several districts of the State and to watch the developments of the trade in general and to move the Railways in case of delays occurring in the supply of wagons. A close liaison is also maintained with the Collectors of all districts in the State and the working of the Zonal scheme is reviewed every year in Consultation with State Governments. Manufacturers in all the producing centres complain that the markets allotted to them are not able to consume their output which is due to the fact that the potential capacities of the producing centres is in excess of the requirements of the markets allotted to them. The only outlet for this surplus salt is the Calcutta market and if the manufacturers avail of the natural advantages afforded to them by way of long dry season, port facilities and proximity to Calcutta market and produce salt by improved layout and methods of manufacture so that as good a quality of salt as of West Coast manufacturers is produced, they would be in a position to market their salt in Calcutta at competitive rates and thus find an outlet for their surplus production.

(a) *Export to Calcutta.*—Attempts were made to export salt to Calcutta by sea during 1914-17 and again during 1921-23. The first attempt was made by one Mr. Somasundaram Chettiar who secured the best salt from the Government Factory at Vallur in the hope of establishing a market at Calcutta. The transaction did not prove to be successful. Exports in 1921-23 were chiefly prompted by the changes in duty but a large part of the salt exported to Calcutta could not be sold and had to be destroyed. In 1929 the Mahalingam Salt Works, Tuticorin, exported 86,000 maunds to Calcutta by Sea. There was no export in 1930. Protection to Indian salt was granted under the Salt (Additional Import Duty) Act, 1931, as a result of the enquiry by Tariff Commission and there was a revival of export to Calcutta which increased considerably owing to the improvements in the quality of Tuticorin salt and the import restrictions adopted by the Government to attain self-sufficiency in this commodity. The following table shows the quantity of salt moved by sea to Calcutta:—

(In maunds)

1932-33	4,29,222
1933-34	3,52,912
1934-35	4,17,429
1935-38	2,24,957

	(in maunds)
1936-37	33,306
1937-38	83,639
1938-39	3,316
1939-40	3,52,748
1940-41	5,73,190
1941-42	2,61,816
1942-43	23,75,596
1943-44	4,82,574
1944-45	5,31,501
1945-46	6,86,192
1946-47	6,92,254
1947-48	2,01,237
1948-49	1,10,700
1949-50	13,24,000
1950-51	18,87,000
1951-52	21,57,000
1952-53	26,86,000
1953-54	20,39,000
1954-55	26,26,000
1955-56	19,33,000

Madras salt is sold at Calcutta at prices ranging from Rs.165 to Rs. 185 for uncrushed salt and from Rs. 200 to 215 for crushed salt per 100 maunds. Most of the factories in Madras State have not so far been able to produce a high quality salt acceptable to the Calcutta market and if the salt manufacturers particularly those in Tuticorin improve their methods of manufacture, they will be able to secure a steady market for their surplus production.

(b) *Export to Japan.*—As an outlet for Madras surplus production especially from Tuticorin the Salt Department has been trying to create export markets in Japan; as a result of which, 106 lakh maunds (5,833 tons) were exported to that country from Tuticorin in 1949. Since then in spite of attempts further quantity could not be exported from Madras, mainly due to the quality of salt being inferior. The manufacturers should, therefore, pay their attention to improve their quality at least to that extent which may be acceptable (94% to 96% NaCl on wet basis) in that country.

I.—PREVENTIVE MEASURES

Prior to 1-4-1947 while Salt duty was in force the levy of duty on salt was ensured by (a) fencing and guarding the pans in which it is manufactured (salt) (b) guarding the salt while it lies on the ridges and on the

drying grounds, (c) its storage after careful weighment in heaps or in bags on fenced and guarded platforms, (d) its issue under supervision by a second weighment in the case of salt stored in heaps and by a careful counting in the case of bag stored salt, (e) checkweighment of every consignment by superior officers and (f) removal under permit from the factory. The Madras factories are all enclosed by a cactus hedge and in the absence of cactus, screw guarding arrangements were in vogue in duty days throughout and surrounding the factory by dividing them into number of guard posts and these were frequently patrolled day and night by officers. Now that the Revenue function of the Department has gone, there has been drastic reduction of Watch and Ward Staff in all the factories. All the guard posts have been abandoned and only a skeleton staff is available in the factories whose main function is to guard Government property and incidentally also the storage platform as best as they can.

The maintenance of watch and ward staff by the Department has been subject to criticism by the various bodies such as the Salt Experts Committee. The Salt Experts' Committee recommended that as salt no longer was subject to excise duty, the watch and ward staff employed by the Government should be totally withdrawn from the private salt works. If the manufacturers desired they could have their own watch and ward staff. The recommendations of the Committee have been accepted by the Government in principle, and no separate staff for watch and ward is now maintained. The peons now employed for guarding the Government property in a factory have also other duties to perform in connection with common services, issue of salt from the platforms, office etc. and they cannot be stated to be employed solely for watch and ward purposes.

(i) *Illicit Salt*.—There are extensive swamps in Madras Region where large formations of good quality salt take place during the hot months of April, May and June in Northern Division and also during July and August in Southern Division of the Region. The swamps are located in Ramnad and Mudukalathur Taluqs of Ramnad district, Thiruthuraipundi Taluq of Tanjore district, Sulerpet Nellore Taluq of Nellore district the saline tracts in Coimbatore and ceded districts. Prior to 1-4-1947 when Salt duty was in force, these formations were sources of great temptation to the inhabitants, in and around the localities mentioned above, as they could collect and remove spontaneous salt in large quantities and sell it at a very cheap rate to the local consumers. In some instances they resorted to manufacture of salt by areas. An extensive preventive force was maintained by the Salt Department of that time to prevent and suppress such illicit manufacture or removals of swamp salt. In many instances the salt concessions given as a result of Gandhi-Irwin Pact of 1931 were withdrawn from these areas in consequence of their abuse. The preventive force generally consisted of a Sub-Inspector (now designated as Inspector) and peons the number of which varied according to the extent of the swamp and the locality of its situation; the armed police were also attached with some of these parties. The offenders used to be sent up by the preventive parties before the Inspectors (now designated as Superintendents) who after holding preliminary investigations used to challan the accused for trial before a Magistrate. The number of offences against Salt Laws increased markedly during 1933-35 as will be evident from the following figures:—

1930-31	1931-32	1933-34	1934-35
238	231	843	1,102

The increase was mainly due to liberalisation of salt concessions as a result of Gandhi-Irwin Pact. Owing to this abuse, the concession had to be withdrawn from several areas and the preventive staff strengthened. After the abolition of the Salt duty there has been no organised collection of swamp salt or attempts to manufacture salt from saline earth as in many of the above areas regular factories have sprung up, under the 10 acre concession. These factories produced large quantities of salt and sold the same at cheap rates and therefore temptation to collect swamp salt or to make salt from saline earth disappeared.

(ii) *Small scale Manufacture.*—Prior to 1931 there was no unlicensed production of salt in the country. This concession permitting such production was first introduced as a result of Gandhi-Irwin Pact *vide* Government of India, Finance Department (Central Revenues) Press Communiqué, dated 22-5-1931. It was intended to benefit the poor classes living in villages immediately adjoining areas where salt could be collected or made for domestic use and sold in their respective villages. Such salt, however was permitted to be carried only on foot in headloads and it was not intended that there should be sale for purpose of trade outside the village limits. This was the start of the first small scale production of salt with Government permission.

The concessions allowed under the Gandhi-Irwin Pact were substantially liberalised by the Press Note, dated the 23rd April, 1948. Under this, an individual or group of individuals were permitted to produce salt without licence (under the Central Excise and Salt Act, 1944) in any land to which they had lawful access and by whatever process they desired, provided the area was not more than 10 acres. The produce in such areas was exempted from the levy of cess of Re. -/2/- per maund unlike the production of licensed factories. The Government, however, reserved the right to take suitable preventive measures against the sale of unwholesome salt for human consumption. In actual practice, however, the salt produced under the above concession has not been subjected to any quality control so far, whereas salt produced in similar areas under licence has been subjected to rigorous quality control. The advantage of this Press Note has been fully taken by the people particularly of Madras Region where numerous small scale salt works have been started. Further this manufacture, of late has been competing with licensed manufacture in the long established factories and in some markets the produce of unlicensed manufacture has ousted the product of licensed manufacture as the cost of the former is cheaper by Re. -/2/- per maund due to non-payment of cess. This small scale manufacture under the above concession in many instances was mainly started around the existing licensed factories so that it could utilise the same set of producers. Although the condition of the Press Note was that the manufacturer should have legal title over the area, in many instances, the unlicensed production has been started by encroaching upon State Government waste lands, as the local Governments were not very keen to suppress this unauthorised occupation of their lands. The Salt Department in the year 1949 under an executive order began to license some of these small scale manufacturers in places where their aggregate or contiguous area of manufacture exceeded 10 acres. This was, however, resented by the unlicensed producers and as a result an agitation was started and representations were made to the Government. The order was subsequently withdrawn in 1952. Since then this small scale production has increased by leaps and bounds.

The chief object of extending this concession in 1948 was to meet the local requirements and to fill the gap which existed at that time between the supply and the demand in the country as a whole. The production

in 1947 was 520 lakh maunds and the requirements of the country about 650 lakh maunds. The balance of the requirements over the indigenous production was met by imports from foreign countries such as Aden, Pakistan etc. The fillip given by the above concession and also because of the drive of the Salt Department to make the country self-sufficient in salt, the deficit production was wiped out in 1951 but at the same time the tempo of small scale production increased considerably in the country. The following table will show how this production has increased from April, 1948 up to date:—

Year	Small Scale Production of Salt (in ,000 maunds)	
	Total (Whole India)	Madras including Andhra
1948-49	..	..
1949-50	293	..
1950-51	1357	341
1951-52	2725	1547
1952-53	4417	2515
1953-54	4742	2403
1954-55	5663	2649
1955-56	4181	2847

In the Press Note dated 23-4-1948 it was laid down that the Government reserved the right to take suitable preventive measures against the sale of unwholesome salt for human consumption. As stated earlier actually, however, no steps have been taken until now to test or control the quality of this production. The reasons for the same are that this production is spread over a large area and no machinery was set up by the Government to effect the quality control or to test the quality of this salt. Further no statutory power was given to the Government to control the quality of this production. In addition, this production is not required to observe any condition for storage, sale, etc. which is in vogue for the licensed production. Thus with all the above advantages and exemption of cess, the small scale production is in a better position to market its produce and it has utilised this opportunity to the full extent.

Although the total production of private and unlicensed salt as compared to the total licensed production of salt, was not much in the beginning, it has now in certain sectors grown to such an extent that the licensed production in organised factories has been hit hard. The pockets where such production has concentrated considerably are Pennuguduru, Gurzanapalli, Kahuparti, Chinnaganjam Laxmipuram, Manginapudi, Thuru-puttalu, Krishanapatnam, Tada etc. in Andhra and Tuticorin, Kayapapatnam, Arumuganeri, Keeranur, Kandukum Taluq etc. in Madras State. Had this unlicensed private production been distributed uniformly over the whole of Madras Region, it would not have affected the production of

organised factories as it has done now in the above pockets. This concession of 10 acres has been abused considerably in several ways. The small scale works in many instances exist merely in name but in fact large works have been organised and operated by enterprising traders and merchants with the intention of evading payment of cess and operation of quality and price controls etc. and the provisions of the Central Excise and Salt Act. Further these traders have exploited the poor salt labourers as in some cases they have entered into contracts with them to purchase their salt at a very cheap rate and then dispose it of at the market rate thus making all the profit for themselves.

(iii) *Swamps and their Development.*—Out of the several swamps distributed along the East coast, the following swamps, Kakrapalli, Vedaranyam and Bombari have attracted much attention in the recent years and particularly Vedaranyam Swamp as its development is supposed to add considerably to the salt industry in India.

(a) *Kakrapalli Swamp.*—It is a large swamp extending over an area of 5 square miles and is adjacent to the Bhavandapadu, Naupada and Mula-peta factories. The Salt Department contemplated to develop a large size factory at this site supplying salt to soda ash factory which was at one time proposed to be started at Sindri (Bihar). It is reported that rain water as well as tidal waters from the sea collects in this swamp during rainy season which subsequently percolates into the soil and forms such soil brine. Being a low lying area and having a soil of tenacious black clay ideal for salt manufacture, there should be no difficulty in laying out a salt works in the swamp. The Salt Experts Committee after visiting this swamp, however, did not recommend the starting of a salt works here particularly for supply to Sindri Factory in Bihar as there were handicaps in getting copious supply of brine (the supply being limited to pit brine in spite of sea brine) and further the works required to be protected from inundation being in low lying area. Besides it was considered that the factory would not be able to sell salt at economic price to Sindri Factory due to the high railway freight. The idea, therefore, to start a factory here was shelved.

(b) *Vedaranyam Swamp.*—This great swamp runs to a distance of about 28 miles along the coast from Vedaranyam in the east to Mthupet in the west in the Thiruthuraipundi taluk of the Tanjore district. It is 5 to 6 miles broad and covers an area of 144 square miles. It is more or less rectangular in shape and two of its sides lie along the sea coast (Bay of Bengal and Palk Strait). There is a fresh water lagoon towards the western end of the swamp fed by four streams during the rains. During high tides in May and June the sea flows into the swamp from the Palk Strait through two creeks and submerges it entirely. When the high tides subside the sea water recedes partly into the Palk Strait through the same creeks leaving behind a sheet of water in the swamp which gets rapidly evaporated and deposits salt over a wide area of the swamp. The monsoon rains in October flow into the swamp through six small rivers and the salt is washed back into the sea. If properly utilised the Vedaranyam swamp is a promising source of supply of salt and could materially add to the production of the country. As far back as 1874, 7 1/2 lakh maunds of spontaneous salt was reported to have been collected from this swamp for consumption in the neighbouring areas. However, when there was Duty on salt the collection of salt from this swamp was banned. Consequently on the abolition of Excise duty on salt in 1947, the Government of India removed the restrictions on the collection of spontaneous salt from all swamps, as a

result of which this swamp was also exploited. It is estimated that about 2 lakh maunds of salt per annum can be collected from this swamp. It is reported that merchants employed labour to collect salt and sell it in competition with the salt produced at Vedaranyam factory. As the quality of spontaneous salt is superior to that produced in factories, being pure and white containing 96-98% sodium chloride, it is but natural that it finds a ready market.

The Salt Experts Committee who visited this area in April, 1949, was amazed to see the immense possibility of salt production in this swamp, and therefore, desired that a special officer should be posted here by the Salt Department for a period of 6 months to determine and collect the data required for starting a factory here of spontaneous salt. Accordingly this was done and the observations of the Special Officer showed that the density of the incoming brine at the time of floods was 4° Be' but at places it was as high as 11° - 16° Be'. The density varied from time to time owing to tide and fluctuations and sporadic showers of rain. It was also reported that within two weeks of the entry of the sea water into this swamp the brine over a large area reached a density of 24° Be' and the depth of it was between 1'-2'. This rapid rise in density in such a short period is presumed to be due to the dissolution of salt from the saline earth. The thickness of the crust of salt which was formed varied from $\frac{1}{2}$ to 1 inch and it was calculated that the quantity of salt formed with an average thickness of $\frac{3}{4}$ " in this swamp was about 6 lakh tons or 160 lakh maunds. All the water that came during the floods was, however, not retained in the swamp but with the fall in tide it receded back. If, however, all this water could be impounded, the production would be such as to meet the entire requirements of the country. The main problem in the utilisation of the flood water is its storage and prevention of dilution by the rain water that passes through this swamp into the sea. The S. E. C., however, recommended that this was an engineering problem and should be examined in detail, if it was considered by the Government to develop this swamp under its auspices. The Committee, however, recommended that in the first instance steps be taken to organise the collection of swamp salt on as extensive a scale as possible. In addition salt could be produced for a period of 3 months from the high density brine available in the swamp in pans laid along the north fringe of the swamp, provided that arrangement is made for the transport of salt into the consuming areas.

The Salt Department acting on the above recommendation of the S. E. C. encouraged the licensees of Vedaranyam to develop the swamp into a model salt works on a co-operative basis. The result, however, has not been very fruitful and only a few people came forward to utilise the flood water by expansion of their works. Two big leases however, have since been granted in this area covering about 700 acres of land and one of them is a Co-operative Society of the labourers. The lessees in both the cases were advised to utilise the high density brine obtained from the swamp during the hot months and the factories had been planned accordingly by them in consultation with the Salt Department. It is, however, extremely doubtful that private enterprise would come forward to utilise the whole of the swamp area particularly as transport of salt from this area either to the interior market or for exporting purposes to Calcutta or foreign markets is difficult. If Government intend to develop this area and agree to spend a few lakhs of rupees, Vedaranyam can easily be developed into another Sambhar factory with many more advantages which Sambhar lacks, particularly the brine supply. With the application at Vedaranyam of the

technical experience gained at Sambhar, Government could be sure of meeting an increased demand for good quality salt due to industrial development in years to come, particularly in South India.

(c) *Bombari Swamp*.—This swamp runs to a distance of 7 miles along the Mariur coast of Ramnad district. It covers an area of 5 square miles and extensive deposits of salt are reported to occur during the months of June and July. Many preventive parties were stationed at this swamp during Duty days and constant affrays were reported in this area. The Salt Department in 1949 wanted to organise the collection of salt in the swamp on a co-operative basis which proposal could not mature owing to the non-enterprising villagers of the adjoining areas and the location of the swamp at a point bereft of all communications.

J. IMPROVEMENTS AND EXTENSIONS

The Salt Experts Committee after visiting a number of factories in Madras Region made several recommendations for the improvement of the salt industry in southern parts of the country (i.e. Madras, Andhra and Travancore-Cochin States) which are being implemented by the Salt Department in gradual stages. The major and important recommendations are:

1. The areas under cultivation in all the factories should be redistributed to obtain a ratio of 1 : 4 to 1 : 7 between the crystallisers and reservoir-cum-condenser depending on the initial density of the brine used.

2. Wherever the area of a factory is below 100 acres it should be made 100 acres and the small licensees operating in such areas should be made to combine into co-operative groups and work as single units areas not less than 100 acres each.

3. Ways and means to develop the important source of supply in the Vedaranyam swamp have to be explored.

4. The single irrigation system should be replaced by the multiple irrigation system in Cuddalore, Adirampatnam and Tuticorin Circles, due to the favourable period of weather.

5. The production of a light variety salt should be replaced by the heavy variety. This of course is dependent on the change in the manner of the sale of salt from "Sale by Measure" to "Sale by Weight".

6. No new salt works in the Region (Andhra, Madras and Travancore-Cochin States) should be taken up till all the factories improve the quality of their product suitable for the Calcutta market or until a demand arises for the export of salt to other countries.

7. It is estimated that the existing salt works could increase their production to more than 12 lakh tons (330 lakh maunds) by improving their methods of manufacture and by a proper redistribution of the pan areas.

8. The larger works should be induced to take on their staff technically qualified personnel and to establish their own analytical Laboratories for the chemical control of manufacturing operations.

Model Salt Factories and Research Stations in Madras Region

The Salt Department in Madras laid great stress on the quality of salt produced at different factories until the year 1929. A standard used to be declared at the beginning of the manufacturing season and the manufacturers

were required to observe the same. The Salt Officers were required to see that the production of the manufacturers conformed to the standard. Any salt below the standard was rejected or destroyed and was not allowed to be stored on the platform. In order to help the manufacturers to produce good quality salt, attempts were made by the Department to demonstrate the manufacture of standard salt. In the year 1911 in the Voyalur factory (Ennore Group), close to Madras, a model saltern was laid down in imitation of the Italian system of manufacture of salt and the production was conducted and controlled by the Government. In this saltern, reservoirs, condensers and crystallisers were laid down in certain ratios, condensing areas being 75% of the total area. Manufacture was carried out on scientific lines and the crystallising beds were sanded. The salt produced was pure, white and small grained.

In 1918 about 74 acres in Levingipuram factory of Tuticorin, were laid down by the Government as a model unit and worked departmentally for a short time. This ceased with the leasing out of the factory in 1921. This unit has the advantage of pit brine as well as sea brine and is ideally situated for the purpose of a model factory.

The Salt Experts Committee after examining a number of salt factories in India and their primitive state of development came to the conclusion that if the quality of salt was to be improved and the salt works were to continue to operate both economically and efficiently it was desirable for Government to set up model factories in principal salt producing centres to serve as demonstration units for the guidance of both small and large producers.

The Committee also concluded that as salt was a low priced commodity, its sale territory was largely limited by freight rates and its successful manufacture required a market reasonably close to the place of production. The Committee, therefore, was of the view that the industry should be as widespread as possible and for that purpose model factories should be started by Government at different producing centres to educate the manufacturers in the method of standard and scientific production of salt, as for a large country like India, a single model factory could not be adequate because the climatic conditions varied from place to place and different methods were adopted for manufacture at different places. The Committee, therefore, suggested that in the Madras Region (Andhra, Madras and Travancore-Cochin States), there should be at least 4 model factories as follows:—

(1) Travancore-Cochin	1
(2) Tuticorin (Madras South)	1
(3) Ennore (Madras City)	1
(4) Naupada (Andhra)	1

The minimum area for a model factory as prescribed by the Experts Committee is 100 acres as this is the minimum economic unit in their opinion. A model factory should be model one both in its layout as well as in the method of operation. The Committee, however, suggested that in at least 2 of the above factories in the Madras Region, namely at Travancore and Madras, research units should also be set up to investigate methods for improving the quality and the yield of salt in the marine salt works and also the recovery of the by-products. The Committee, however, said that there should be no overlapping of research activities between the Council of Scientific and Industrial Research (as under their auspices a Salt

Research Committee was functioning) and the Salt Department, but there should be close co-operation between the two. Accordingly in the opinion of the Committee, problems of fundamental nature could with advantage be investigated by the Salt Research Committee of the Council of Scientific and Industrial Research, while the research units at the model factories should be utilised for arranging field experiments and large-scale trials bearing on the results of laboratory experiments carried out by the C.S.I.R. in their laboratories. In order to control the production at each stage and also to see that salt of the required standard alone is produced, it was also suggested to attach to each of the model factory, a small laboratory where occasional analyses of brine and regular analyses of different products namely, gypsum, common salt, etc. could be carried out as a routine procedure by a competent chemist.

In pursuance of the above recommendations of the Salt Experts Committee, the Government of India decided to open a factory at Tuticorin and Levingipuram factory (platform III), was selected for the purpose as it had the advantage of enough brine supply, both from pits and sea and also ideally located for demonstration purposes. It was decided in the first instance to resume the factory after the expiry of its lease in 1954 but as the lessee of this unit has agreed to start model production under Government direction and control the lease in his favour has been renewed. The production here, however, will be conducted by the Salt Department under its direct supervision. The unit is likely to be fully developed by 1958 for demonstration purposes. Even now it is producing pure salt in a part of the factory which has been realigned, for sale in Calcutta. This salt has also been liked when exported to Malaya and Penang.

Other than the above, the Salt Department has proposed to start by 1958 three more model factories in Madras Region *viz.* one in Andhra, one in Travancore and one near Madras. The site for the factory in Travancore-Cochin is under examination. There is no suitable place to start a factory at Ennore near Madras City as suggested by the Salt Experts Committee and, therefore, this site has been changed to Semanjeri in Chingleput district of Madras which is about 20 miles from Madras proper. The Department has plans to start more model factories in the Madras Region after the above have been established.

K.—RECOVERY OF BY-PRODUCTS

The recovery of by-products of salt industry did not attract any attention of the Indian salt manufacturers earlier but of late some by-products have been recovered by some of the manufacturers in Saurashtra and Tata Chemicals of Bombay (Mithapur). The salt producers of South India did not pay any attention to it. The model salt factory which existed in Travancore during erstwhile state regime made some attempts in this direction and Messrs. Mettur Chemicals at their salt works at Adirampatnam also tried some experiments to effect recoveries of some chemicals other than salt. Considering the large production of salt in the vast stretch of 600 miles in the East-coast, the production of by-products, if undertaken, will be considerable and it is, therefore, desirable that this side-industry should be developed along with salt production.

The model factory at Travancore conducted experiments to recover, by solar evaporation, magnesium sulphate and potassium salts from the bitters after separation of crude salt. During the war this model factory

also found a novel use for the bitters of 36° Be' as an agent for water purification in place of Alumina ferric or Aluminium sulphate which was in short supply. The magnesium chloride present in bitters helped to coagulate the suspended impurities in water when used with lime. Experiments on the use of the bitters for the consolidation of the road-surface were also undertaken and attained with some success. However, the results of these experiments could not be finally established by transforming and developing them on a large scale for the development of by-products industry of salt, as soon after the integration of Travancore State with the Indian Union, this model factory was dissolved as it was a very small unit comprising only 8 acres and the staff employed by the State Government in this factory was disintegrated.

The only by-product that has gained some importance is gypsum. The model factory at Travancore made it a regular practice to recover gypsum as a by-product from the second set of condensers where brine used to be concentrated from 12° Be'. The beds of these condensers were tamped like the beds of the crystallisers at the beginning of the season and gypsum deposited therein was recovered at the close of each season by draining out all the liquid from the condensers. Before scraping the beds they were allowed to be dried for 2 or 3 days when the crust of crude gypsum detached itself and then it was raked. This crude product containing 85% of hydrated calcium sulphate was then agitated with water in a suitable cistern to remove the adherent clay. This process was repeated twice or thrice and clean crystals of gypsum were obtained which were dried on bamboo mats and stored in the open. The yield of crude gypsum was reported to be about 7 tons per acre of the area covered by the high density condensers (for raising the density of brine from 12 to 23° Be') or a little over one ton per acre of the total area under salt production. From 7 tons of crude gypsum about 4 tons of gypsum of a composition of 97.7% of hydrated calcium sulphate was obtained. After the dissolution of the model factory in Travancore this area has been taken over by an adjacent lessee of Thattirupuodai factory and he is also producing gypsum. As, however, there is not much demand of gypsum within this State and it has to be carried a long way to Tuticorin or other areas for disposal, the manufacturer does not feel very enthusiastic about it. The Mettur Chemicals at Adirampatnam have also introduced the recovery of gypsum as a regular practice. The Salt Experts Committee suggested that the importance of recovery of this product should be brought to the notice of the major salt works in the country and they may be induced to produce this as it will help in the economic production of salt.

Of late the value of this material obtained as byproduct in the salt industry has also been realised by the progressive Tuticorin manufacturers many of whom have now constructed gypsum pans for collecting this material in the course of salt manufacture in pursuance of the recommendations of the Salt Experts Committee. A cement factory which was started close to Tuticorin utilises the gypsum thus obtained as this material is much purer than the same obtained by mining where such mines exist. The Andhra salt factories and other factories in Madras State should also take to this production of gypsum as it has a potential market.

Gypsum is used in the manufacture of plaster of Paris, cement, fertilisers etc. The Fertiliser Factory in Travancore requires gypsum as a raw-material and for sometime, it has been difficult for them to get it and they

had to import it from other countries. Thus if the Travancore salt producer can recover this by-product from their salt works which is not at all difficult, they will also find a ready market for disposal of this material.

Attempts should also be made to manufacture other by-products of salt as magnesium chloride, magnesium sulphate, calcium chloride, etc. by the large units of salt factories in Madras Region, as in that case their cost of production of salt will be reduced to a large extent, as well as the above chemicals many of which are now imported, will be indigenously available.

L.—HISTORY OF ADMINISTRATION

The Government salt monopoly in Madras was first mooted by the Board of Revenue and was established about 1805. The agency entrusted with the task in the initial stages was, from 1805 to 1808, a General Agent at the head of Collectors. In 1808 the Collectors were placed in direct subordination to the Board of Revenue on a commission basis. The commission plan was, however, done away with in 1836. The agency of administration soon came in for criticism. In 1852 the Court of Directors themselves suggested the appointment of special officers over Salt and Abkari as distinguished from Revenue; Mr. Plowden also made recommendations for segregation along identical lines, but no action was taken beyond the appointment of Salt Deputy Collectors in some districts. As has been seen before, in 1876, a Commission was appointed under the orders of the Government of India, to investigate the whole question of the administration and the collection of Salt Revenue in the Presidency. As a result of their recommendations, the administration of the Salt Revenue was placed under a separate department with a Commissioner, Deputy Commissioners, Assistant Commissioners, Inspectors and the necessary subordinate staff. The reorganisation of the Department was completed in 1884-85 both in the maritime districts and in the interior. In the same year the Government decided to entrust to the Commissioner the supervision of the Abkari Revenue of the Presidency and to employ the Salt Preventive force of Abkari work conjointly with Salt duties. The Commissioner of Salt and Abkari Revenue was then made an ordinary Member of the Board of Revenue. The joint administration of the Salt and Abkari Departments continued till 1924, when, as a result of the Reforms, 'Salt' became a 'Central' subject, and "Excise" a "Provincial transferred" subject. With effect from 1st April 1924 a separate Salt Department was created with a Collector at its head, independent of the Board of Revenue, Madras. The Collector was assisted by a Secretary who was of the grade of an Assistant Commissioner. The Department was at first under the control of the Madras Government, but was transferred to the control of the Government of India administering through the Central Board of Revenue from 1st January 1926. The Presidency was at first divided into Assistant Commissioner's Divisions with headquarters at Cocanada and Negapatam, but it was soon found necessary to create a third Division with headquarters at Madras. In pursuance of the policy of retrenchment the post of the Collector of Salt Revenue was merged with that of the Collector of Customs, Madras, with effect from 1st March 1932. From the same date the department was placed in the immediate charge of a Deputy Commissioner and the post of the Secretary to the Collector of Salt Revenue was abolished. From 1st March 1932 to 1st February 1934 the department was administered by the Collector of Customs, Madras as *ex-officio* Collector of Salt Revenue assisted by a Deputy Commissioner. With effect from 1st February 1934 the administration of the Customs

Outports in the Madras State was amalgamated with that of the Salt Department. The combined Department was administered by the Collector of Customs and Salt Revenue assisted by 3 Deputy Commissioners and 3 Assistant Commissioners till 31st October 1936, when the post of a separate Collector of Salt Revenue and Customs (Outports) was revived; the post of Headquarters Assistant to the Collector was also created in place of the Deputy Commissioner. The Sugar and Match excises were transferred to the control of the Collector of Salt Revenue from the 1st April 1938. During 1941-43, the Collector was assisted by a Personal Assistant in the grade of an Inspector (now designated as Superintendent instead of by a Headquarters Assistant). With the addition of the Tobacco Excise, from 1st March 1943, a post of Additional Collector of Central Excise was created and the jurisdiction of Divisions and Circles was revised. The post of Headquarters Assistant Collector was also revived. From 1st April 1944, the administration of the new excises on Tea, Coffee, Betelnuts and Vegetable products was also entrusted to the Department. From the 1st March 1945, the post of Additional Collector of Central Excise was replaced by the post of Deputy-Collector of Central Excise. There were 10 Assistant Collectors of Divisions, with Headquarters at Kakinada, Guntur, Bezwada, Bellary, Madras, Trichinopoly, Tuticorin, Coimbatore, Calicut and Cochin besides an Assistant Collector, Intelligence and the Headquarters Assistant to the Collector. Under the Assistant Collectors of Divisions there were 45 Inspectors (now designated as Superintendents), 26 of which were in charge of Central Excise Circles, 4 in charge of purely Customs Circles, 10 in charge of combined Salt, Customs and Central Excise Circles, and one in charge of Central Excise and Customs Circle. Consequent on the abolition of the Salt Duty in 1947 and transfer of the Salt Department to the Ministry of Industry and Supply, the administration of the Salt Department was taken over by the Salt Controller for India at New Delhi, and he was assisted by 3 Deputy Salt Controllers one at Bombay, one at Madras and one at Headquarter. The Madras Region, comprising Headquarters of salt factories in Madras, Andhra and Travancore-Cochin States, has been placed under the Deputy Salt Commissioner, Madras. He is assisted by two Assistant Commissioners one at Kakinada and another at Tuticorin and six Circle Officers in the rank of Superintendents of Salt. Below the Circle Officers (which is the lowest gazetted rank in the new Salt set-up there are Deputy Superintendents and Inspectors of Salt. The Deputy Superintendents of Salt are in charge of Factories and the Inspectors are required to assist them. Wherever factories are small, they are placed directly in charge of an Inspector without a Deputy Superintendent. Between 10 to 14 salt factories are placed in charge of a Circle Officer or Superintendent of Salt in Madras Region. The names of the Circles with their headquarters and the factories in each Circle are shown below:—

Circle	Headquarters	Factories
Naupada	Naupada	Pundi. Bhavanapadu. Mulapeta. Naupada. Calingapatam. Konada. Bimilipatam. Balacheruvu. Karasa. Pudimadaka. Polavaram.

Circle	Headquarters	Factories
Penuguduru . . .	Penuguduru . . .	Jagannaickpur. Pennuguduru. Gurzanapalli. Tuiruputallu. Pendraga. Manginapadi. Chinnaganjam North. Chinnaganjam South. Kanuparti.
Madras . . .	Madras (Tondiarpet).	Pakala. Pakala Private. Iskapalli. Krishnapatnam. Tada. Thillai. Voyalur. Attiput North. Attiput South. Vallur. Covelong. Cheyyur. Chunampet.
Cuddalore . . .	Cuddalore . . .	Markanam. Cuddalore. Manambadi. Neidavasal. Tranquebar. Negapatam. Vedaranyam. Tambikottai. Adirampatnam. Kuttumavadi.
Tuticorin . . .	Tuticorin . . .	Theethandathanam. Vattanam. Morekulam. Manakkudi. Veppalodai. Arasadi. Karapad. Levingipuram. Sevandakulam. Urani. Urani Extension. Kalavasal (Private). Kayalpatnam. Keeranur. Kulasekarapatnam.
Nagercoil . . .	Nagercoil . . .	Thamarakulam Old Allom Group. Thamarakulam Extension. S. M. K. M. and S. S. Allom. S. M. G. N. and Puthallom. Rajakkamangalam. Colachel. S. C. T. M. Allom. Palkulam. Variyoor. Thattarippudai. Malipuram.

The designations, the Salt Controller, the Deputy Salt Controller and the Assistant Salt Controller have been changed to Salt Commissioner, Deputy Salt Commissioner, and the Assistant Salt Commissioner since May 1952.

An Inspector is the lowest executive staff in a factory and below him are only class IV staff which comprises of two categories Petty officers and Peons. Petty officers are entrusted with the supervision of peons and generally supervise sales of salt as well as other affairs of the factories. The peons are required to help the Factory officers in the maintenance of the factory, its office, guarding of Government properties in the factory, looking after the common services, namely, roads, channels, platforms and also minor repairworks in the factory.

A Circle is the smallest unit of administration and the Circle Officer is primarily responsible for the efficiency of the Circle and for the maintenance of accounts and other statistics. He is responsible to see the efficient production and distribution of salt as well as maintenance of adequate stocks in factories to meet any emergency. While Duty was in force the Superintendent and all officers under him including class IV, were required to handle fire-arms and there used to be regular parade and drilling exercise for them. With the abolition of Duty this function has ceased. To control the manufacturing operations of salt manufacturers (both major and minor) in several factories of Madras Region, to educate them in the proper method of manufacture, to induce the manufacturers to take to scientific methods of manufacture, to maintain a homogenous and favourable atmosphere among the manufacturers or licensees and to co-ordinate their activities are now the responsibilities of the Salt Department and its officers. The Department is also responsible for developing co-operative societies of the minor licensees wherever possible and also to look to their welfare as far as possible. All this does not prove to be an easy task for the officers of the Salt Department. With the production drive inaugurated soon after the partition of the country in 1947, many new works have come into existence and the existing factories have expanded considerably. The number of staff in the Salt Department has not been correspondingly increased with the result that the present staff is working under strain. The question of strengthening the staff is under Government consideration.

CHAPTER IX

MANDI SALT MINES

A.—HISTORICAL

The quarries in Mandi (Himachal Pradesh) have been worked from times immemorial. No authentic records of early times exist. There is, however, ample evidence to show that work in these sources has been going on for a number of centuries. The extent of old workings and the usual annual production leads one to conclude that these mines are at least 1,000 years old. The history of Mandi Rajas which can also be traced back to a period of nearly 1,000 years, testifies that the salt mines being the principal source of revenue to the Mandi State were considered by the Rajas as their personal property or at least something of a reserve upon which the Royal family could easily draw upon.

In olden times, the trade in salt was carried on under the barter system—the commodities exchanged being grains, meat, goats and sheep, bamboo baskets, ropes, wooden logs—the last named article being required in connection with quarrying and mining operations.

The method of mining salt in olden times also gives an idea of the antiquity of the mines. The Mandi salt is hard and massive in character and requires continuous blasting operations. There was, however, a practice in vogue whereby salt could be won without resorting to blasting. This was accomplished by making undercuts, side-cuts and overcuts into that salt with the help of channels of clay over large and wide flow over the salt to enable a deep cut to be made in salt. The undercuts when complete enabled big blocks of salt to be detached from the massive salt rock by the use of wedges and sledge hammers. During the pre-British days the Moghals and Sikhs are reported to have visited and worked the mines. At Maigal, in one of the gorges, remains of old Sikh workings can still be seen. After the fall of the Sikh regime, the Raja of Mandi signed a treaty with the British Crown in which there was a specific mention that the mines would be worked by the Mandi State and revenue derived by it. Some account of these workings is found in the Administration Reports written by various officials of the Government of India, the Provincial Government and the former Mandi State. Dr. Jameson, Mr. Blanford, Sir Haydon, Dr. Medlicott, Dr. Warth and Mr. Bolster are some of the Geologists of the nineteenth century who have made a mention of these deposits and mines in their works. Dr. Jameson in his report (March 1843) gives a graphic description of the Mandi mines. Mr. Leppel Griffin, Under Secretary to the Government of the Punjab in "The History of the Punjab Rajas" throws some light on the subject. He states with respect to Mandi salt that "in 1820 the price of salt at the mines was 7 annas, in 1846, 8 annas, and in 1864, 12 annas per maund. In 1845 the revenue from the salt was Rs. 60,000. In 1850 it had risen to Rs. 83,000 and in 1862, to Rs. 1,00,545. There was a decrease in 1867-68 on account of the great quantity of rain that had fallen during the year which hindered the working." Mr. Barnes, then Deputy Commissioner of Kangra, in his report on Mandi for 1850-51 said "The sale of Mundee salt yielded last year, when British salt was double its present price, Rs. 83,000. I am confident that this sum will never be realised again under the same circumstances which are not likely." "The cost of establishments and working", Mr. Leppel Griffin estimated, "is

about 20 per cent on the amount of salt sold." Prior to 1871 the whole revenue realised from the sale of salt at the quarries situated in the Mandi State was received by the Raja, whose property they were the sale price being 10 annas a maund as fixed in 1846 on the annexation of the Jullundur Doab by the British Government. There was no duty. From the year 1865 to 1869 nearly a lakh of maunds of Mandi salt entered into the British territory annually and replaced Khewra salt on which the levy was much higher. So the quarries were first visited by an English Officer in 1869-70 and the British Government started negotiations with the Raja to check diffusion of this salt into British territory or to recoup them for the loss of revenue sustained by them. Thus Government establishment was first entertained at the mines under Government of India's orders in 1870. An Inspector of the Inland Customs Department was first stationed at Mandi mines in December 1870. His duty was to register the sale of salt from the quarries at Guma and Drang. On this salt it was decided that the Raja of Mandi should tentatively impose a duty of 10 annas a maund in addition to the selling price of 10 annas a maund. Thus the total selling price fixed was Rs. 1/4/- a maund or 32 seers per rupee. This duty of 10 annas was to be paid by the Raja to the British Government on all salt imported into the British territory.

Sales with new duty began from 1st February 1871. In the first two months 21,792 maunds were sold out of which 13,227 maunds went to the British territory. Prior to posting of the British officer a system of barter prevailed there. The Raja's establishment took wood, meat, ghee, etc., in exchange for salt. Of course, no account of such sales went to the Raja. This was prohibited and all payment was ordered to be made at the mines. Salt trade in those days laboured under great difficulties; salt was not always available and buyers had to wait. The country being sparsely populated, the news that salt was available took some time to filter through. There was shortage of labour as well. In case of epidemics amongst the cattle, no carriage was available and the salt trade suffered.

The duty of the British officer posted there was to see that destination were correctly registered and that salt was sold at the correct rate; but many traders gave wrong destinations. The State officials did not like the new arrangements and so did not co-operate. The working and control of the quarries was in their hands.

This arrangement for registration of destinations of sales, etc. having not proved satisfactory, it was decided in 1880 to abolish it and to divide the duty of 10 annas a maund levied on all salt in the ratio of 2 to 1 between the British Government and the Raja. In 1883 the Raja represented that the reduction of the Government rate of duty in 1882 was adversely affecting the sale of Mandi salt in British territory. The Government of India issued orders in 1884 reducing the duty from 10 to 6 annas a maund. Government was to receive 4 annas a maund and the Raja 2 annas. The total selling price was accordingly reduced from Rs. 1/4/- to Re. 1/- a maund. In 1888 the selling price was raised to Rs. 1/2/- a maund (price Re. -/10/6 and duty Re. -/7/6), British Government getting 5 annas and the Raja 2½ annas out of the proceeds of the duty. The Mandi salt contains about 25 per cent impurities. Moreover, the cost of production was very high, so the Government of India ordered that the duty was to be kept at about one-fifth of that in force in British India.

In 1889 the Raja was permitted to raise the price to 10½ annas per maund. In 1886 Mr. Patterson, with a view to reducing expenditure, put

forward a proposal for the removal of the establishment maintained in Mandi on the Raja's agreeing to pay over a lump sum annually equivalent to two-thirds of the average total duty levied, arguing, that as the basis of division had been satisfactorily established no sufficiently useful purpose was served by the retention. This proposal did not commend itself to the Punjab Government and was dropped. It was revived by Mr. Strickland when officiating as Commissioner, Northern India Salt Revenue, in 1922 and received the approval of the Mandi authorities, the Punjab Government and the Government of India. The arrangement made was to remain in force for five years in the first instance, the sum agreed upon for the composition being Rs. 19,000 annually, subject to proportionate revision in the event of any increase or decrease in the rate of duty in British India. The arrangement then made whereby the duty on Mandi salt was fixed at approximately one-fifth of that in force in British India was maintained, but the State was given liberty to increase or decrease the price of salt. The staff of Northern India Salt Revenue Department, costing some Rs. 7,000 annually, posted at the quarries was entirely withdrawn from the 1st July 1922, but the Department retained the right of inspection of the registers, quarries, etc., and the State undertook to maintain such registers as the Commissioner, Northern India Salt Revenue might require and to permit inquiries regarding the information contained therein. The question of revision of the Agreement made in 1922 for five years was taken up and after some correspondence the Government of India were pleased to fix the composition amount at Rs. 6,000 per annum. They also agreed that the duty which the Durbar must levy might be maintained at Re. -3/9 per maund. This rate was subject to revision in consequence of any change in the rate of British Indian duty. It was made clear to the Durbar that such revision would not necessarily be proportionate, but that the maximum increase which the Government of India might require the Durbar to make in their rate of duty would not be more than the amount by which the British Indian rate was increased. On the representation of the Durbar the Government of India, however, agreed to the retention of the 1: 5 ratio between the Mandi duty and the British Indian duty till the end of the Agreement which was to remain in force for a period of 10 years with effect from July, 1927, when the old Agreement expired. This arrangement was extended from time to time and continued till 1-4-1950 when, as a result of the merger of the State with the Indian Union, control of mines passed on to the Indian Government.

B.—SITUATION, ETC.

The two Mandi salt mines are situated in the Himalayan State of Mandi which lies between 76° and 77° east longitude and 31° and 32° north latitude and were the property of the Raja. Up to 1927 there were two quarries, one at Guma in the bed of the Guma gorge and the other at Drang. Guma and Drang are now mines both situated on the Jogindernagar-Mandi road. Guma is at about 7 miles from Jogindernagar and Drang is 18 miles further away from Guma. Mandi town is 11 miles beyond Drang. (An open quarry is also being worked at Maigal since 1931—about 5 miles from Mandi.)

C.—GEOLOGICAL

The earliest mention of Mandi salt deposits occurs in the following works:—

1841—Moorcroft W. and Traback G.—Travels in the Himalayan Provinces of Hindustan and the Punjab—page 159.

- 1843—Jameson W. on the Geology—Zoology etc., of the Punjab and part of Afghanistan. *Journal Asiatic Society, Bengal*, Vol. XIII, Part II—page 214.
- 1848—Parish W. H.—A report of the Kohistan of the Jullundur Doab. *Journal Asiatic Society, Bengal*, Vol. XVIII, Part I.
- 1864—Medlicott H. B.—on the geological structure and relations of the southern portion of the Himalayan Range between the rivers Ganges and Ravee. *Memoirs, Geological Survey of India*, Vol. III, Part 2, pp. 60—62.

Information regarding the salt is to be found also in Captain Palmer's unpublished report on "Economic Geology of Mandi Salt deposits" and in a small contribution by the late Sir Henry Hayden in the "Punjab Gazetteers—Mandi State, 1920". All that was known till 1920 can be summed up in Sir Hayden's following works:—

"The State lies partly on rocks belonging to the Central Himalayan Zone of unknown age and partly on Tertiary shales and sand-stones. The rocks of the central zone consist of slates, conglomerates and limestones, which have been referred to in the Infra-Blaini and Blaini and Drol groups of the Simla area. The sandstones and shales of the Sub-Himalayan zone belong to the Sirmur series of Lower Tertiary age and to the Siwalik series (Upper Tertiary). The most important mineral of the State is rock salt. The age of the salt is quite uncertain, but it appears to be connected with the Tertiary beds."

Dr. S. K. Roy who worked as the State Geologist, Mandi State, during 1926-27 has contributed the following papers on the geology of Mandi State which give further information on the rock-formations of the State:

- 1928—The Punjab Government Hydro-electric Power Station at Mandi and its bearing on the Mineral Resources of Mandi State. *Quart. Jour. Geol. Min. Met. Soc. India*, Vol. I, Nos. 3, 4, pp. 115—120.
- 1933—An illustration of Nappe Structure in Mandi State, Punjab Himalayas. *Quart. Jour. Geol. Min. Met. Soc. India*, Vol. 5, No. 4, pp. 131—138.
- 1938—Geology and Petrology of the Iron deposits of Mandi State, Punjab (Jointly with Mr. (now Dr.) A. N. Mukherjee). *Quart. Jour. Geo. Min. Met. Soc. India*, Vol. II, No. 2, pp. 49—77.

The Geological formations of the Mandi State, based on the above works, may be tabulated as follows:—

Table showing the Geological Formation of Mandi State

Recent	Alluvium and soil.
Pleistocene	Older alluvia and loess.
Pliocene	Upper Siwalik—Boulder conglomerate and sandstone.
Moicene	{ Middle and Lower Siwaliks—Sandstones and shales.
	{ Kasauli—Grey to greenish sandstones.
	{ Dagshai—Purplish brown sandstones and red clays.
	{ Lochan—Salt-bearing formation.

Eocene	{ Subathu—Limestone. Laki—Carbonaceous shale with pyritous coal.
Permian	Krol—Dolomitic limestone and quartzitic sandstone.
Upper Carboniferous	{ Panjal Trap—Trap and serpentine rock. Blaini—Conglomerate and pink limestone.
Pre-Cambrian (Cuddapah)	Simla—Slates.
Archean	{ Chail—Injection gneiss, garnet-sericite-schist, magnetite-hematite schist, quartz-schist, Granite, aplite lamprophyre. Jutogh—Graphitic slate, quartzite.

As regards the age of the Mandi salt, Captain Palmer of the Geological Survey of India who was deputed in 1920 to carry out a detailed survey of Mandi Salt Mines remarked as follows:—

“I agree with Medlicott that the angular and subangular rock fragments in the salt are derived from the associated Krol rocks but do not agree that, were this proved, it would preclude the contemporaneous formation of the salt, I regard these fragments as due in part to volcanic action (of which here is abundant evidence), and in part to denudation of lower Krol while the upper Krol series were still being formed.

“The salt was probably deposited from the water of a lagoon formed by elevation of the sea bed on which the Krol limestone had accumulated. The whole of the salt rock is calcareous and at Drang, limestone has accumulated above as well as below the salt. During the period of formation of the rock salt there was much volcanic activity in the neighbourhood of the enclosed lagoon and probably much of the fine mineral matter in the salt is in the nature of volcanic dust.

“The conclusion as to the age of the salt is that it belongs to the same period as the Krol limestone of this area. It is unconnected with the Siwalik rocks or with any formation of ascertained Tertiary age.”

According to Dr. Roy, the innermost fault plane of the great Himalayan boundary fault zone runs approximately along the middle of the Mandi State and it is with this fault that rock-salt deposits of Mandi State are closely associated. Along this fault also occur a number of outcrops of grey and pink dolomitic marbles of Krol and Blaini ages which are highly folded or crenulated and crushed. These dolomite outcrops sometimes form hills and occur unconformably related to the underlying rocks which are slate, salt-rock (Lochan) or Kasauli, Lower Siwalik or Middle Siwalik sandstones. The unconformable rootless nature of dolomite hills in relation of the Tertiaries can be distinctly observed in the area along the eastern side of the Maigal-Drang road. Further the discovery of Lower Siwalik sandstone with stringers of coal, next to salt rock (Lochan) to the east of dolomite at Guma indicates that the salt is of Tertiary age. The Mandi deposit of rock-salt is of a dirty reddish colour and it abounds with pebbles of dolomite, serpentine, trap, slate etc. This may be due to tectonic movement taking place almost contemporaneously with the final drying up of the gulf in which Mandi salt was deposited.

Dr. V. S. Dubey with his students, Shukla and Kohli surveyed geologically the salt area in 1946-47 and came to the conclusion that the overlying positions of limestone and the trap with respect to salt beds at Guma are not the true stratigraphical positions and that the salt of Mandi State is Tertiary in age.

According to Mr. Bhag Singh Lamba (1950) the salt occurs sandwiched between the trap rock and Krol dolomite and at some places it is in direct contact with the Tertiaries. The salt is always found to the east of the fault line as part of the Palaeozoic rocks. He is of opinion that salt was probably contemporaneous with the trap and is a result of volcanic activity.

When the Mandi State became a part of Himachal Pradesh, that Government also arranged a geological survey on the recommendation of the Salt Experts Committee appointed by the Government of India. Since the working of these salt mines had assumed some importance owing to the loss of Pakistan Salt Range, a party of four geologists headed by Mr. Boileau and assisted by Messrs. Kohli, Raina and Shrivastava conducted what may be described as the most comprehensive investigation and explained the structural anomaly and tectonic activities which have taken place in this area. They evidently believe that the Mandi salt is Tertiary and have explained in their report the formation of salt plugs as follows:—

“Until the advance of the nappes, the Mandi salt belt appears to have formed an anticline, with two culminations (Maigal Drang and Shilaswar Guma) under a cover of Dagshai-Kasauli rocks (Subathu seems to be locally absent) resting on the limestone, etc. which formed the immediate cover of the salt series The pressure from behind scraped off the salt series from its substratum, and it accumulated in the core of the anticline and more especially under the culminations.

“Later movements fissured the whole axial zone, and drove the gentle flank forward, leaving it standing in scarps at the margin of the Tertiary syncline, whence the massive slips of the Urla sector, and the Guma slide, took place at the end of the lower Miocene. Still later movements drove it on to the eroded Tertiaries of the foresyncline further south probably in the main (post Pliocene) phase when the Trap Nappe came into direct contact. During these movements, the salt series continued to be extruded and eroded; after the sliding off of the limestone cover, the Traps came to rest directly on it, and a complex was formed of broken Trap and leached salt marls, etc., either by true evolution or by the squeezed saline series catching up fan materials when the advance of the Traps was renewed.”

D.—SYSTEM OF MANUFACTURE

(i) *Old System*—Salt has been excavated both at Guma and Drang from times immemorial. Mining or quarrying was practised at both places but not on a large scale. Mr. Leppel Griffin states:—

“There is at neither place excavations such as in Europe would be called mines, the salt being dug out of the face of the cliff or from shallow open cuttings. At Guma the salt is dug from a gorge some 500' below the village to which it is carried to be weighed and sold.” The little mining done must have been discontinued. From 1860 to 1926 only quarrying was done.

The Guma quarry was situated in the bed of the Guma gorge. Salt surface was exposed by removing the surface crust of the gorge bed to a depth of 10' to 30'. This was worked till rains set in and filled the whole quarry with debris flush with the gorge bed. A new site had to be selected next year higher up the bed of the gorge and the process started afresh. Salt was won by burrowing into the seam till the hills above descended into an avalanche of loose stone and earth which used to bury the workings many feet deep. The work of clearing was done partly by manual labour and partly by diversion of the gorge stream to the spot.

(ii) *Present System—Drang Salt Mine.*—Drang salt mine is situated at a distance of 11 miles from Mandi and is the principal of the three sources which have been worked for some time past. It comprises of 3 small villages where salt has been quarried—Nagrota, Bhatogi and Burari. Nagrota is at the northern extremity and Bhatogi at the southern end. Nagrota is at an altitude of 3,700 feet and Burari at 3,200 feet. Burari is situated in the bed of a *nallah* and salt has all along been worked by quarrying in this area; chambers 70 to 80 feet deep have been worked at that place. Bhatogi is a place in between the two extreme ends and here also up to 1930 salt had been worked in open quarries, and the depth of salt to which they worked did exceed 100 feet. In 1930 a tunnel was driven at this place and in 1933 another tunnel was driven. These were driven more or less level and met with earth after going 500 feet in salt. The mouths of the tunnels also were so near the steep and loose hill that every year during the monsoon huge slips took place which completely buried the mouths and it was not possible to inspect the inside conditions for 3 to 4 months during the monsoon. Thirdly, the blasting away of the pillars hastened the end of the mines. Since then at Bhatogi also open pits are being worked which are prepared year after year. At Nagrota, open quarrying has been mostly done as the old pits were also situated in the *nallah* bed. In the year 1944, a tunnel was driven at this place. It was also driven too high without sufficient and strong cover and collapsed after three years. Another tunnel at a low level was attempted in the year 1949. This progressed 150 feet without touching salt. Salt has, however, been tapped here by open trenching and by drilling at depths of 13 feet, 32 feet and 50 feet only.

The output of this mine has varied roughly between 60,000 to 70,000 maunds a year.

Sometime ago a portable air compressor run by high speed diesel oil along with 4 hammer-drills JA-45 and a sump pump were purchased from Ingersoll Rand. This has resulted in saving of labour and increased output from 50,000 maunds to 1,16,000 maunds.

At Drang the old method of preparing a working face every rainy season by removing debris and *lokhan* and exposing salt over an area of 20'×20' or so is still in vogue. The percolation of water etc. and other seepages are collected and bailed regularly to prevent their entering the pit and the sides of the pit are protected against slips and slides by reverting the slopes with dry stone pitching. Having made the site safe in this way, blasting commences and the first 20–30 feet is lowered in salt as a narrow incline when the face is extended. The winning of salt is by the understand sloping method and the pit underground is developed into a wide face 60'×60' and the output is thus increased. Steps or wooden ladders are provided to go down and come up the pit. At the pit top, tip wagons are available on a track of 2 ft. gauge laid horizontally and the tip wagons when full are railed down to the weighing platform where impurities are separated and sales and issues effected.

Guma Salt Mine.—Guma salt mine is situated in a deep gorge at a distance of 7 miles from Jogindernagar and 28 miles from Mandi and the workings are limited to a length of about 1,500 feet long gorge. The workings are situated on either side of a *nallah* which after heavy monsoon every year washes away the debris and lays bare salt ready for blasting. The place being narrow and surrounded by steep and high hills on either side, the limit of quarrying is reached here sooner than at Drang, even though the output of this source was smaller. The maximum length gone into salt has been 300 ft. The tunnels consisted of openings of small size having dry masonry pitched walls and on walls were put wooden supports of local brushed wood. After reaching salt, pillars and chambers which were mostly irregular in size and shape were made into salt. The depth of chambers at this mine is greater than at the other. Chambers as deep as 120 feet to 150 feet have been worked.

The salt mined from this mine contains about 80% sodium chloride and averages about 40,000 maunds annually.

The present workings are laid out in a mine started in 1949 called the 'Low Level Tunnel', which is the largest opening so far gone into. It is about 500 feet long. A tunnel made in pucca masonry of size 8' x 7' has been driven at an altitude of 4,875 feet. It passes through loose ground, sandstone lokhan and there are a few working chambers in the mine.

For the safety of the miners and for providing ventilation a second opening has been made which joins the main tunnel passage underground at a distance of 375 feet face inbye and assures good ventilation as well as safety to the workmen. A drain has been provided to collect all water and let it flow outside. Manholes at regular intervals have also been provided. A two-foot gauge track of 24 lbs. section rail has been laid through the length of the tunnel and extends to the depot which is situated at a distance of 700 feet from the mouth of the mine.

Guma mine is situated at an altitude of 4,300 feet and the climate is very cold. It experiences a rainfall of 90" a year and gets snow-fall during January and February.

Maigal Salt Source.—Maigal salt quarry is about 7 miles from Mandi and is located in the bed of a *nallah* called Khuninal.

This place is reported to have been worked during the Sikh regime of the Punjab. In the bed of Khuninal signs of old shallow workings are visible. Some of the olden people whose race is fast becoming extinct only recently testified to have seen and worked or heard from their forefathers about the location of such workings. From an examination on the spot, it is noticed that salt here is directly faulted against Kasauli sandstones and outcrops on the surface. The *nallah* bed is steep and during rainy season the rush of flood water is capable of washing away the bottom and exposes the salt bed for direct blasting. Being near the faulted junction of the salt, the workings could not be very deep in the *nallah* bed.

Maigal salt quarries were worked during 1930 to 1935 and from 1945 to 1948, whenever there was failure of output at Drang.

Brine Salt.—About 1,200 ft. up-stream in the Gharat *nallah* of the Maigal section numerous springs of brine are issuing out from the hill and stream bed. About 8 years ago, they were not known except that somewhere some brine was coming out and mixing with the main stream. In order to locate the springs, the work of diversion of the stream was taken

up gradually and small diversions of stone were built in the *nallah* bed during the dry season and the flow of the *nallah* was coursed on one side. Two or three years' careful work resulted in changing the course of the stream to one side which directly gave appearance of the actual sites of brine springs. These were all numbered and their densities were measured regularly. It was concluded that on an average about 10° Be' brine at the rate of 3,600 gallons per hour can be obtained from these springs and more springs are likely to be located with further diversion of the *nallah*.

Some steps were taken in the year 1933—35 to utilise the brine. Some reservoirs and kyars were built on the motor road side and the brine of 10° Be' was directly let into these pans. The pans though made of cement were laid in the abandoned bed of *nallah* over unnatural ground and as such temperature changes, severe cold during winter made the cement contract and caused cracks through which brine leaked away resulting in utter loss of brine. The enterprise was, therefore, given up in 1935.

In the year 1948, the abandoned kyars were again repaired. Brine was collected in dissolvers where rejected unsaleable pieces of salt available from the mine were added and concentrated brine prepared in a set of dissolvers laid on a cascade system. The concentrated brine was let into pans in small quantities and on evaporation pan salt fine grained and white in colour was deposited. This was dried on a separate drying platform. Since the kyars develop serious cracks during winter, the operations are not very successful and only 1,500 to 2,000 maunds of salt is produced annually.

During the last 3-4 years it has been decided to utilise the brine in extensive condensers and kyars which are under preparation.

An area of 10 acres has been laid out into condensers and crystallisers. The condensers are 3 in number and 500 ft. × 125 ft. in size. The size of crystallisers is 125' × 50' which are 21 in number. Thus approximately 7 acres of land, has been allotted for condensers and 3 acres for crystallisers. These condensers and crystallisers are on natural ground which is to be puddled and consolidated with impervious clay. The brine is to be brought in one open drain all the way from the springs and let into the condensers where its density will go up to 24 or 25° Be'. Thence it is to be led into crystallisers for final crystallising. Experiments conducted of late have shown that if the brine drain is lined with pieces of salt the density can be raised pretty high during transit of the brine along the drain and the necessity of allotting a very large area for condensation can be obviated. It has been estimated that if all the brine available which measures about 3,600 gallons an hour and which has an average density of 10° Be' at the springs, could be utilised, the output of pan salt can be increased to 6,000 tons during the six dry months of the year. Accordingly one condenser and one set of crystallisers are being completed. The experiment is being given a trial and when it is successful, the operations would be spread further.

E.—PRODUCTION

Production from the Mandi salt sources has always been restricted for the following considerations:

- (1) The workings in the mine were exposed to the danger of sudden collapse due to heavy rains and loose hill-slides.
- (2) The capacity of the mine was limited for lack of proper planning.

- (3) Difficult and expensive transport.
- (4) Relative poor quality of salt, the market for which is restricted.
- (5) No steps were taken to set up salt refineries for the manufacture of pure salt.
- (6) The salt deposits were not worked on scientific lines.
- (7) Better quality salt from the Salt Range (now in Pakistan) ousted this salt.

Despite all these handicaps this salt was used for cattle as well as for human consumption and found ready sale in the hilly parts of Mandi and adjoining areas.

The following table gives the output of salt in some typical years (every fifth year) from 1871-72. From 1917-18 onwards the output is shown for each year:—

Year	Output (in maunds)
1871-72	1,30,150
1875-76	1,30,331
1880-81	1,13,429
1885-86	1,22,370
1890-91	1,30,716
1894-95	1,28,789
1899-1900	1,26,939
1904-05	1,13,104
1910-11	96,695
1915-16	1,03,771
1917-18	1,22,761
1918-19	1,34,658
1919-20	1,29,628
1920-21	1,46,362
1921-22	1,25,011
1922-23	1,20,785
1923-24	1,34,269
1924-25	1,31,154
1925-26	1,23,230
1926-27	1,17,278
1927-28	1,04,815
1928-29	99,070
1929-30	86,697
1930-31	1,22,309
1931-32	1,03,848
1932-33	1,12,255
1933-34	99,969
1934-35	1,18,401
1935-36	1,19,583
1936-37	95,241
1937-38	82,917
1938-39	1,12,637
1939-40	1,15,108
1940-41	1,05,830
1941-42	1,30,685
1942-43	1,24,635

Year	Output (in maunds)
1943-44	1,04,866
1944-45	91,568
1945-46	93,363
1946-47	84,080
1947-48	1,33,719
1948-49	1,06,126
1949-50	1,17,791
1950-51	1,68,451
1951-52	1,33,670
1952-53	1,67,376
1953-54	1,24,927
1954-55	1,39,137
1955-56	1,34,921

F.—SYSTEM OF SALES

The Mandi State introduced a system of wholesale agency for salt on an annual basis. The State authorities invited tenders from traders for appointment of wholesale agents for Mandi salt for a period of one year. The agent was required to lift a fixed quantity of salt from the mines by paying its price on monthly quota basis, to open depots for sale of salt in various important markets and to sell this salt at a fixed rate approved by the State authorities. In return for these obligations, he was appointed as sole agent for sales at the mines for the currency of his contract and was able to get a commission per maund. He was also given route permits for transport of salt to various markets and allowed 1/2 seer per maund as deficit for all issues effected at the sources. In case he furnished due security, he was given some advance to enable him to open depots at various markets and facilities for weighmen, use of telephones and use of surplus quarters for his establishment at the mines.

The provision of route permits enabled him to own his own transport and to take salt to various markets. In the years 1940 to 1943, the people of the State objected to this system as it was the monopoly of one man. Accordingly more than one distributors were appointed on more or less the same terms and this system remained in vogue till 1945. The demand for salt from 1944 to 1947 increased so much that the sources could not keep pace with it owing to heavy damage to the mines and lack of new working places. The Mandi State authorities decided to keep the agency system in abeyance and opened their own depots. Ultimately, when Himachal Pradesh was formed and partial mechanisation of the mine was effected, the output and supply position again improved.

During 1946 to 1949, when the supply position of salt was not very sound, the Mandi State, and later on, the Himachal Pradesh authorities regulated the distribution of salt by opening their own depots in various markets. The wholesale profit of Re. 0-2-0 per maund and retail sale profit of annas three per maund was charged for all sales. The establishment sanctioned was one Depot Inspector, 2 Depot Sub-Inspectors, one Sales clerk, one Weighman and one Chaukidar for each Depot. This system helped people to obtain their genuine requirements of salt. The trader class, however, protested. Later on, as salt production improved, these depots were abolished and free sale was introduced. The Mandi salt is now being sold as a free commodity. Demand, however, exceeds the supply.

Prior to 1946, remittances of sales were received at the sources against salt. In 1946, this system was abolished and all transactions except small sales were centralised in the Salt Department office at Mandi where a Treasury is also situated. The clerk used to collect money from traders, permits were issued in token of payments against which salt was issued at the mines. The amount was remitted to the Government Treasury. From 1st April 1950, when the salt mines were taken over by the Union Government, all treasuries in Himachal Pradesh were authorised to receive price for Mandi salt on standard forms and the Treasury advised receipts accordingly to the Superintendent of Salt, Mandi, enclosing the indent in original. Authorities for issue of salt were then issued on the source.

The sale of salt is classified into three categories; (1) Road-borne, (2) Banjara, (3) Farodis.

For the Road-borne trade the upper limit for each load of salt has been fixed at 80 maunds and the lower limit at 70 maunds which is the carrying capacity of each truck and remittances for this class of sale were regulated through district treasuries.

As regards small sales to Banjaras, remittances are received in the office of the Superintendent of Salt, Mandi, against which Banjara passes are issued. On presentation of these passes at the mines salt is issued to the Banjaras.

Farodis are appointed for retail sale within the protected area, namely, 10 miles from the salt source. These Farodis draw their supplies by remitting money into the Treasury. They have to keep account of the receipt and sale of salt. The system of cash sales at the sources has thus been completely done away with.

G.—SELLING PRICE

The selling price of salt was first fixed at ten annas a maund in 1847 when there was no duty. The rate in 1937 was Rs. 1-4-0 a maund, when the Darbar was authorised to increase or decrease the price of salt. The present price is Rs. 1-12-6 a maund excluding cess at Re. 0-3-6 per maund.

H.—ISSUES AND DISTRIBUTION

Mandi salt has its market only in those interior regions of the Himalayas where the means of transport are very difficult.

From the surrounding hills of Mandi, Suket, Bilaspur, Kulu, Kangra, Lahoul and Bushair, used to come annually during November and December thousands of people—men and women—with bamboo baskets tied to their backs bringing products of their land for sale in the town. These articles were wool, dried fruits or meat. In return, they carried mainly sugar, salt, dyes and yarn for their requirements.

Salt to Lahoul and villages in mountains is carried on goats and sheep and is exchanged for food-stuffs like maize or potatoes. Irrespective of cold or snow these animals can climb any altitude. In the less mountaineous tracts of these hills, mules and ponies owned by a special class of Banjaras spread almost all over Mandi for carriage of salt and food-grains from villages to towns, carry back a substantial load of salt to villages and sell it either for cash or for kind. They purchase salt from the mines or from the markets for onward transmission and distribution in the far off villages where no motor roads exist.

About two decades ago, the trade in cloth, fancy goods and other essential commodities required by hill folks was carried by means of camels and bullock-carts from Hoshiarpur and Jullundur markets of the Punjab *via* very difficult mule and bridle tracks having all sorts of short and stiff curves, rise and falls. On return journey from Mandi they carried salt to avoid empty run. Most of the trade has now diverted from Hoshiarpur and Jullundur to Amritsar and Delhi which are linked by very good motor roads as well as railway line.

Since the Mandi town as well as the mines have no rail link, the major portion of the trade in Mandi takes place by means of motor trucks. Prior to 1926, no motors plied in Mandi but subsequently a regular service (Passenger-cum-goods) was introduced. During the slump period the freight charges for 200 miles (from Mandi to Amritsar) used to be Rs. 1-4-0 per maund due to hard competition. The construction of motor roads in Mandi district opened out the country and salt was able to reach the various markets by means of motor trucks at very cheap freight.

Commodities of trade in these hills being very few, the only articles which are exported to the plains are salt and potatoes. In return the people bring foodgrains, cloth, spices, fancy goods, kerosene oil, molasses, sugar, iron and steel goods. The freight rates are still very high as compared with the rates in the adjoining areas. In certain seasons, the trade in potatoe is so heavy that exorbitant charges are charged by the transporters. Conversely, in certain slack seasons, the rate is low.

I.—MARKETS

Mandi salt was always consumed in the States of Mandi, Suket, Chamba, Bilaspur and Rampur Bushair (now included in Himachal Pradesh) and in the adjacent British territory. From about 1850 to 1870, about one lakh maunds of this salt annually went into the Simla, Kulu, Kangra, Hoshiarpur and Jullundur districts of the Punjab. When the price was raised, imports into British territory gradually decreased and this salt was replaced by Khewra and Warcha salt (now in Pakistan). Guma salt used to come to British territory and Drang salt went to the then Native States. Sales to Simla fell off with the opening of the Simla Kalka Railway.

The average quantity sold was about 1,30,000 maunds. The produce of the Mandi quarries is consumed throughout the area of the Kangra district including Kulu; in parts of the Gurdaspur and Hoshiarpur districts; in the Simla Hill States and in the hill States of Mandi, Chamba, Suket, Bilaspur and Rampur Bushair. Its boundaries may be said to be fixed, though to a certain small extent, Punjab rock-salt sometimes drove it back slightly in the Hoshiarpur and Gurdaspur districts and in the Simla Hill States, or was in turn driven back, according to the seasons, the state of the roads and the scarcity or abundance of transport.

At present the salt finds its way to the following markets:—

- (1) Mandi District.
- (2) Kangra District.
- (3) Gurdaspur.
- (4) Kathua and Udhampur Districts of Jammu and Kashmir.
- (5) Kulu Sub-Division.

- (6) Lahoul—the tribal belt along Tibetan border.
 (7) Suket Sub-Division.
 (8) Bilaspur.
 (9) Rampur Bushair Sub-Division of Mahasu District.
 (10) Chamba District.

Calculated on the basis of rates of goods transport as fixed by the Provincial Transport Authorities, the wholesale rates of salt in various markets of the above territories should be as under, after taking into consideration that the price ex-Source inclusive of Establishment charges is Rs. 2 per maund.

Serial number	Name of District	Name of locality or market	Distance in miles from source	Wholesale rate	Remarks
					Rs. a. p.
1.	Mandi District	Mandi town	11 miles	2 6 0	} Except Joginder-nagar all issues are made from Drang.
		Ratti	21 miles	2 11 0	
		Bhambla	35 miles	3 2 0	
		Sarkaghat	44 miles	3 6 6	
		Baggi	23 miles	2 12 0	
		Pandoh	23 miles	2 11 0	
		Thalaut	33 miles	2 15 3	
		Aut	36 miles	3 0 6	
		Sundarnagar	27 miles	2 14 0	
		Dehar	41 miles	3 5 0	
		Chambi	27 miles	2 14 0	
		Jogindernagar	7 miles	2 14 0	
2.	Kangra District	Baijnath	21 miles	2 8 9	} All from Guma Mine.
		Palampur	32 miles	2 12 6	
		Nagrota	46 miles	3 1 0	
		Dharamsala	62 miles	3 6 6	
		Kangra	55 miles	3 4 0	
		Shahpur	64 miles	3 7 0	
		Nurpur	90 miles	3 15 3	
3.	Kulu Sub-Division	Kulu	55 miles	3 8 0	} All issues from Drang.
		Katraip	67 miles	3 13 0	
		Manali	79 miles	4 2 0	
4.	Gurdaspur District	Pathankote	104 miles	4 4 3	From Guma.
5.	Chamba District	Banikhet	145 miles	5 6 0	} Ditto.
		Chamba	173 miles	6 4 0	
6.	Mahasu District	Rampur	} Partly from Drang and partly from Guma.
		Theog	..	..
		Solan	..	..
7.	Jammu and Kashmir	Kathua	From Guma.
		Udhampur	From Guma and Drang.

The following table gives the issues of salt effected during various years:—

Year	Issues in maunds
1917-18	1,33,801
1918-19	1,31,922
1919-20	1,29,672
1920-21	1,45,619
1921-22	1,26,617
1922-23	1,22,549
1923-24	1,19,127
1924-25	1,31,225
1925-26	1,22,215
1926-27	1,19,449
1927-28	1,07,231
1928-29	1,07,306
1929-30	94,029
1930-31	1,14,396
1931-32	1,02,392
1932-33	1,19,464
1933-34	94,250
1934-35	1,23,602
1935-36	1,21,101
1936-37	91,950
1937-38	85,363
1938-39	1,09,669
1939-40	1,09,254
1940-41	1,08,846
1941-42	1,37,304
1942-43	1,25,286
1943-44	1,04,500
1944-45	88,213
1945-46	87,203
1946-47	69,530
1947-48	1,14,988
1948-49	1,07,925
1949-50	1,05,968
1950-51	1,44,363
1951-52	1,37,627
1952-53	1,41,177
1953-54	1,36,120
1954-55	1,07,448
1955-56	1,39,425

J.—QUALITY OF SALT

The salt is of dirty plum colour with deep and red clay finely disseminated in it and is of very inferior quality. It contains about 73 to 87 per cent of sodium chloride, the rest being impurities, earth or marl. Sometimes it is mixed with quartzite, sand-stone and lime-stone pebbles. The impurities are insoluble and separate when salt is dissolved in water. It cannot be used for human consumption in the form in which it is quarried, though it is given to cattle in the natural state. For alimentary purposes it is purified by being melted, strained and recrystallised by boiling or the strained and clarified form itself is used. Brine salt which is being manufactured in small quantities is, however, just like Sambhar salt, and used as it is.

The rock salt quarried and mined from these mines is bluish grey in colour, compact and massive. To the naked eye, it appears a homogeneous mass in which impurities of carbonate of lime and magnesia and silica are disseminated and are more or less uniformly distributed. The chief ingredients of a lump of this rock salt consist of "Halite", dolomite and silica, the latter two being insoluble in water. Though the sodium chloride content of Mandi salt is very low, the impurities are insoluble in water and as such can be easily separated. Some-times, thin bands of pure salt or salt rich in potash are also encountered in the working chambers but the quantity available is small. Results of analysis of typical samples of salt as conducted from time to time are reproduced below:—

Samples analysed at the Deodani Laboratory (Sambhar Lake) in June 1950

MAIGAL

	Brine at 10° Be' on dry basis	Brine Salt
Calcium sulphate	0.34	0.38
Magnesium sulphate	0.25	1.17
Magnesium chloride	Traces	0.51
Sodium chloride	98.47	95.94
Sodium bicarbonate	0.93	0.32
Insoluble . . . . .	..	0.84
Moisture . . . . .	..	0.84
TOTAL .	99.00	100.00

	Drang Brine Salt	Guma Brine salt	Maigal Brine Salt
Calcium sulphate	0.12	0.99	0.38
Magnesium sulphate	0.59	0.28	1.17
Magnesium chloride	0.47	0.77	0.51
Sodium chloride	97.54	96.51	95.84
Sodium bicarbonate	0.46	0.40	0.32
Insoluble	0.36	1.01	0.84
Moisture	0.46	0.04	0.84
TOTAL .	100.00	100.00	100.00

ROCK SALT DRANG

	Representative sample	Selected sample
Calcium sulphate	0.55	0.67
Calcium chloride	0.53	0.83
Magnesium chloride	0.43	0.56
Sodium chloride	65.85	78.89
Sodium bicarbonate	0.74	0.61
Insoluble	30.34	16.70
TOTAL	100.00	100.00

GUMA SALT MINE (ROCK SALT)

	Representative Sample	Selected sample
Calcium sulphate	0.70	0.79
Calcium chloride	0.57	0.54
Magnesium chloride	0.43	0.39
Sodium chloride	79.87	90.76
Sodium bicarbonate	0.65	0.50
Insoluble	16.24	6.86
Moisture	1.54	0.16
TOTAL	100.00	100.00

Analysis carried out by M/s. Escher Wyss Ltd. of Switzerland

ROCK SALT ANALYSIS

	Maigal	Drang	Guma
Soluble salt %			
Cl ₂	46.87	42.12	47.50
SO ₄	0.39	0.24	0.49
Ca	0.19	0.16	0.25
Mg	6.02	0.02	0.03
Calculated composition			
Sand (Insoluble metal)			
NaCl	20.14	28.70	18.78
NaCl	77.30	69.50	78.30
MgCl	0.08	0.08	0.10
Crystal water and remaining salt	1.84	1.18	1.97

ANALYSIS OF MAIGAL BRINE

Specific gravity of sample	1.0733 compared with water.	
Component	Cont. Gr./Litre.	
SO ₄	0.7407	
Ca	0.4788	
Mg	0.0	
Calculated composition		
H ₂ O	966.3	90.031
NaCl (Salt)	105.4783	9.827
Ca SO ₄ (Gypsum)	1.0492	0.098
CaCl ₂	0.4725	0.044
TOTAL	1073.3000	100.000

K.—LABOUR

All operations both on surface and underground at the Mandi mines were being carried on by manual labour. The State authorities resorted to forced labour; the Tehsildars of the illaqa were asked to arrange labour for the mines. Batni labour was another class of labour available cheap at the mines. It was also more or less forced labour. Every villager who went to the mines to purchase salt was called upon to work there for a day. Thousands of people came to the mines every year in large or small groups and worked at the mines in this way. This type of labour is no longer employed now.

Apart from these two types of casual labour, the regular labour for the mines is mostly derived from the villages in the vicinity of the mines. The villages from Maigal to Guma have mostly developed near the salt sources and are concentrated on the motor road side. The people are quite accustomed to working conditions at the mines both on the surface and underground. They have also a fair knowledge of the extent of old workings and can guide, with a certain amount of certainty, the administration in respect of locating the new mines.

The regular labour being local, prefer to live in their homes. They have to be collected every day and sent to their villages after the work is over. This is done by a departmental truck which collects them every morning for the main Drang salt sources and disperses them in the evening after working hours.

Wages and Privileges

In the 19th century the wage level was Re. 0-0-9 to Re. 0-1-0 per labour per day. Besides this wage, the labourer was entitled to certain privileges such as:—

- (i) a good feast by the State or the contractors;
- (ii) free supply of salt,
- (iii) paid leave for a number of days when required,
- (iv) to receive some help from the mines free of charge in case of near relative's death,
- (v) paid holidays, etc.

In the first quarter of the 20th century, these privileges remained in force but subsequently they were gradually withdrawn by increase in the wage level from Re. 0-1-0 a day to Re. 0-2-0 and Re. 0-3-0 a day and some privileges in the revised form.

From 1930-1940, the wage level was increased to Re. 0-4-0 and Re. 0-6-0 a day and the miners were given bonus on production. Thus they were able to earn from Rs. 15 to Rs. 20 a year in addition to their wages. They were also given paid holidays on the fairs and festivals. The monthly feast was converted into a cash reward. With the advent of World war II wages increased rapidly.

Year	Wages (per day)					
	Rs. as. p.			Rs. as. p.		
1930-40	0	4	0	to	0	6
1943-44	0	8	0			
1944-45	0	10	0			
1945-46	0	12	0			
1946-47	1	0	0			
1947-48	1	4	0			
1948-50	1	8	0			
1950-51 to date	1	10	0	to	1	12

26 days in the year were declared as paid holidays to the miners. These consisted of 12 Sundays (first Sunday of every month) and 14 days on account of fairs and festivals.

From 1940 onwards, the Mandi State permitted even cash advances to be given to miners to be adjusted against their earnings. The practice however, proved objectionable and was stopped.

In 1944, foodgrains stores were started for the two sources of Drang and Guma and provided a lot of relief to the miners.

The bonus on production at Rs. 1-9-0 per hundred maunds was allowed up to 1948. After that year it was withheld. The concession of cash reward for monthly feast was also disallowed from 1948 onwards.

With effect from 1950, the paid holidays were also disallowed. At the time of withdrawal of this concession an increase in wages was granted.

Labour welfare work and application of labour laws

All the Central Acts apply to the Mandi Salt Mines with effect from 1949, viz.:—

The Indian Mines Act, 1923; The Factories Act with respect to Salt Pans, 1945; The Explosives Act, 1883; The Workmen's Compensation Act; The Payment of Wages Act; The Mines Maternity Benefit Act, 1941.

The rules and regulations, laws and byelaws framed under the above Act ensure safety and healthy working conditions for the labour and provide several amenities which were unknown in the past.

L.—MECHANISATION OF MINES.

Prior to the formation of Himachal Pradesh, all that was available at the mines by the way of simple machines was a small length of 18 lb. section tram line and one or two 30 cft. capacity tipping wagons used for the haulage of salt on surface level sidings. The question of mechanising and electrifying the mines was seriously considered by that Government and in view of the recommendation of the Salt Experts Committee, simple machines such as Air Compressor—capacity 210 cft. at 100 lbs. pressure, Hammer drills—JA-45-four, Utility hoist—capacity $\frac{1}{2}$ ton lift 125 ft., Sump pump—one, Pipe line, other accessories like jack bits, jack rods, hose pipe, etc., motor truck, for collection of materials and labour, Jeep.

Government have also sanctioned appropriate establishment for the running and maintenance of these machines. The output has, therefore, increased of late and considerable saving in labour resulted.

Electrification of the mines has been taken in hand. At present, however, the compressor is working with high speed diesel oil engine.

M.—ADMINISTRATION

The early history of these salt mines is very obscure. There is very little information to throw light on the way the salt mines were managed. The Raja of Mandi, whose property these mines were, concerned himself with a lump receipt of money from the contractor appointed for the excavation and sale of salt, irrespective of what happened at the mines. It appears that in the early stages, the establishment consisted of: (1) *Dani*, (ii) *Dhori*, (iii) *Kotwal*, and (iv) *Dhrung*.

Dani used to be an educated man. The word is derived from the persian word “DANA” meaning a wise man. He was the chief man at the helm of affairs whose orders were to be obeyed by all and he used to collect money, etc.

Dhori.—The word “Dhor” is local word and means to set things right. “Dhori” therefore was a person who was responsible for the satisfactory running of excavation operations.

Kotwal was in charge of the Treasury Guard, and management of labour for the mines was also one of his duties.

Dhrung is “Shotfirer”, the person in charge of locating drill holes, charging and blasting operations.

This establishment was retained at each source when the Mandi salt mines were the property of the Raja and worked by the State. In 1870 an Inspector of the Inland Customs Department was stationed at Mandi with two Sub-Deputy Inspectors and establishment to register sales of salt to British territory. A Superintendent was posted in 1878-79. An extra Inspector was sent in 1892. Two Inspectors with charge allowances were posted to the two quarries instead of a Superintendent and Inspector without allowances from July, 1901. The management and working of the quarries remained with the State. Other Government officers visited the quarries from time to time but only to give advice. The Northern India Salt Revenue establishment was entirely withdrawn from 1st July, 1922. After the staff of the Salt Revenue Department was withdrawn in 1922, the Mandi Darbar was called upon to maintain regular account of production and sales. They, therefore, appointed one Inspector and one Sub-Inspector for each

Mine and one clerk and peons and weighmen for guard duty as well as weighment. This establishment remained under the Minister-in-Charge, Revenue Department for some time but about 1930 the Salt Department was made a branch of the State P.W.D. under the State Engineer.

When the working of salt mines became difficult and the revenues to the State from salt began to show signs of depletion in 1936 for the first time a Mining Engineer was appointed but the affairs of the mines did not improve much as no attention was paid towards organising the department on proper lines and no proper system of accounting was introduced.

It was only in 1944, that some establishment for the Mining Engineer was sanctioned and the production and sales branches of his office were reorganised and the accounting system on more or less the then State P.W.D. lines was introduced. This continued after the formation of Himachal Pradesh in 1949, which wanted to reorganise the department but before it could do so, the Salt Mines were transferred to the Government of India on 1st April 1950. The Salt Mines were constituted into a Circle, the Circle Officer (known as Mining Engineer and the Superintendent of Salt) being under the control of the General Manager, Rajputana Salt Sources Division. At present, he is under the Deputy Salt Commissioner (Headquarters). Though final adjustment of staff is still pending, the following technical establishment has been taken over by the Government of India: Mining Engineer, Surveyor, Inspectors, Sub-Inspectors, Divisional Accountant, Accountant, Clerks, Laboratory Boy, Dresser, Mechanic, Driver, Cleaner, Fitter, Peons, etc.

The mates, shotfirers, artisans and skilled and unskilled labour form temporary labour entertained on daily wage basis on the Muster Rolls.

N.—PROPOSED DEVELOPMENTS (ESCHERWYSS SCHEME)

The loss of rock salt mines of Pakistan after partition created a temporary shortage of salt at least in those markets which that salt used to cater. The rock salt deposits of Mandi, which though impure in quality, assumed importance and the attention of Government of India was invited towards these deposits by the Chief Commissioner, Himachal Pradesh, soon after the formation of that State early in 1948. Simultaneously the Government of India in their Resolution of the Industry and Supply Ministry No. Salt-12(1)/I&S/48, dated the 15th April, 1948, constituted the Salt Experts Committee to advise them on the best means to attain self-sufficiency in salt as well as to improve the quality of edible salt and fix minimum standards of purity, etc. The Committee visited Mandi mines in October, 1948 and recommended that:—

- (a) A detailed geological survey of the present mines should be undertaken to determine the extent of rock salt deposits.
- (b) The present method of mining should not be continued for more than a couple of years by which time positive steps should be taken for introducing the method of mining by means of brine wells and installing evaporators for the production of good quality salt.
- (c) A thermo-compression evaporation plant would be most suitable for Mandi mines as hydro-electrical power for working this could be made readily available.

- (d) Messrs Escher Wyss Ltd. might be entrusted with the survey of these mines to determine the best method of exploiting these salt deposits and drawing up general layout and plan for a suitable evaporator plant.
- (e) The restoration of Railway link between Nagrota and Jogindernagar and expansion of the broad gauge link between Nangal to Mandi should be considered.
- (f) The manufacture of iodised salt at this source should also be taken into consideration when the brine evaporator plant was established there.

As a result of the recommendations of the Salt Experts Committee, the services of Messrs Escher Wyss Ltd., Switzerland, who specialise in the manufacture of high grade salt were obtained to carry out a Technical Survey of the Mandi mines. That company sent to India a Mining Engineer of the Austrian Government working in their salt mines with a Technical Representative of their own. Both of them visited the mines staying there for nearly a month and examined the possibilities of utilising the deposits for manufacture of high grade salt in the most economical manner.

In their report they covered a very large ground which has enabled them to present a comprehensive survey of these deposits. Messrs Escher Wyss have recommended that the well known method, "BRINE CHAMBER METHOD" in vogue in Continental salt mines may be followed with advantage in the Mandi mines. The method consists of selecting suitable sites for sinking shafts right into the bottom of salt so that a good thick cover of salt is left on the roof. From the shaft bottom level or inclined galleries would extend on all sides except in the direction in which the boundary of salt is likely to reach or towards the old workings. At regular intervals from these tunnels, right angled galleries would be driven which would terminate into cylindrical shallow chambers which would ultimately be used for preparation of brine. In order to facilitate haulage of men and materials, winding and haulage equipments both on the pits and in underground tunnels would be installed. Besides this inlet and outlet pipes for pumping fresh water or unsaturated brine and for pumping out concentrated brine would be installed. In the brine chamber, concentrated brine will be prepared by the action of water on the sides and roof of chambers which will become larger and larger in size and will ensure more and more supply of concentrated brine. The sites for obtaining concentrated brine in sufficient quantity have been selected at Drang and Maigal Salt Mines where the deposits are less disturbed. The brine thus available is proposed to be pumped to a distance of nearly 29 miles to Jogindernagar which is the railhead. It would thus be best suited for locating a refinery as the rail link will enable the product of the salt refinery to be distributed to various markets.

Since the soluble content of Mandi rock salt consists of sodium chloride, very little preliminary treatment for separation of impurities of objectionable character is called for. The brine is thus fit for direct treatment for manufacture of refined salt.

The method proposed to be adopted for the manufacture of refined salt is called "Thermo-compression". Mandi is far away from any coal supplying areas and multi-effect evaporators have not, therefore, been found to be economical. In this case Electricity is readily available at Jogindernagar from the Hydro-Electric Power Station of the Punjab Government;

and it could be used to work thermo-compressors which would evaporate the brine into a thick slurry of pure salt which when passed through centrifugal driers would result in yielding a clean, dry and pure product. The processes of crushing, pulverising, sieving and iodising, etc. would all be performed by mechanised and electrical means and finally even bagging would be done mechanically. The finished product would thus be available for direct loading into wagons which the Railway would provide within the factory premises by means of siding. The full production of the factory is estimated to be 66,000 tons a year within three hundred working days, *viz.* about 200 tons a day.

Economics of the Proposed Scheme

It may be interesting to have a brief and general idea of the economical side of this very attractive scheme which would be unique not only in India but in the whole of the East and which promises a high class product for table:

Expenditure	Non-Recurring	Recurring
	Rs.	Rs.
Mining Section	15,00,000	
Pipe Line Section	13,00,000	
Refinery Section	58,00,000	
TOTAL	86,00,000	22,00,000

As against this investment, the scheme proposes to produce ex-factory 66,000 tons of salt at Rs. 30 per ton including depreciation, maintenance, cost, royalty and other charges which have a direct bearing on the cost of production. When this salt is sent to market, it will be capable of bringing quite good revenue, but even if it is sold with nominal return consisting of 10% on capital and 4% on revenue expenditure the sale price ex-factory will work out to Rs. 1-10-0 a maund or Rs. 44 a ton.

The advantages claimed by the specialists accruing from the installation of such a refinery are:

- (i) The great natural assets which for want of proper planning have so far remained neglected and exploited, could be usefully utilised for the manufacture of high grade edible salt and could also meet the requirements of pure salt for industrial use.
- (ii) Salt being the base of so many chemical industries the installation of this factory will open a new era of Industrial Development in the country, in that this refinery will be capable of meeting the demand of the principal raw material namely, pure brine or pure salt.
- (iii) The northern India which derived its supply of edible salt from the Salt mines gone over to Pakistan has been more or less deprived of the pure product which the people of this region are used to and the refined salt of Mandi will more than compensate for the loss by supplying exceptionally pure quality salt to them.
- (iv) Within 300—400 miles radius from the factory, the refined salt will be able to meet the demand of the people at competitive prices.

- (v) The refined salt when iodised will also prove to be of immense use to millions of population who are in the grip of goitre prevalent in these hilly districts.

Before embarking on such a large scheme, the Government of India decided that boring should be done to prove the definite and ample existence of the salt deposits. It was also decided that experimental Core-drilling should be done by the Geological Survey of India and if they could not undertake it, they should suggest some suitable firm to do this. The Geological Survey of India recommended M/s. Associated Drilling and Supply Company, who were experienced in this type of work. A programme was drawn up by the Geological Survey of India and the drilling commenced in 1952 and continued till June 1953, but no conclusive evidence about reserves could be obtained. The programme had therefore to be revised by the Geological Survey of India and the second phase of drilling started in December 1953 and salt cores were recovered. During 1954, Mr. Leschanowsky, the Austrian Expert of M/s. Escher Wyss and Co. was invited to visit the site and to finally advise on the basis of the drilling results and suggest any modifications to their original scheme. Mr. Leschanowsky came to India and after visiting the site, examining the data, had discussions with the Geological Survey of India. They came to the conclusion that there exist enough reserves to last for 10 years at least if 66,000 tons of refined salt is produced every year. It has now been decided to have shaft-sinking as it will be helpful both in dry and wet mining. Action, as suggested is now being taken to develop these mines. Sites have been chosen and tenders for shaft-sinking have been invited. The work on shaft-sinking will commence in November 1956 and is likely to be completed by the end of 1957.

CHAPTER X

ORISSA SALT SOURCE

A.—HISTORICAL

(i) *Pre-Muslim and Pre-British.*—Before we go into the history of the Orissa salt Industry, we have to remember that under the British rule Ganjam district formed a part of Madras and the districts of Puri, Cuttack and Balasore formed a part of the Bengal Presidency. The present province of Orissa was formed in 1938. Details about the salt industry in Bengal have already been given. The pre-Muslim and the pre-British and the systems of Monopoly, Agencies, etc. under the British rule as mentioned in the Bengal chapter applied to the Orissa salt manufacturing areas of Puri, Cuttack and Balasore also.

Salt was manufactured from time immemorial along the extensive saliferous tracts of Orissa. The sea-coast of Orissa was prosperous. The industry was an essential means of sustenance to many thousands of people. It gave subsidiary employment to many agricultural labourers in the off-season which also coincided with the period of salt production. The saline tracts of the Province extended for about 230 miles along the western shores of the Bay of Bengal from the river Subarnarekha on the north to the district of Ganjam on the south. There were vast tracts of marshy woodlands along the sea-coast from the neighbourhood of Konarka Temple to the Subarnarekha varying in breadth from 5 miles to 20. The Rajas and the Zamindars whose estates bordered on the sea-coast availed themselves of this natural advantage for the manufacture of salt.

In those days there were two processes of manufacturing salt, namely, the solar evaporation process and the boiling process. The salt manufactured by solar heat was known as Kurkutch salt, and that by boiling as Panga salt. The Hindu reckoned salt made by the sun to be purer than that evaporated by the artifices of man, *i.e.*, by the boiling process. The former alone entered into the temples and throughout the whole of Orissa the respectable classes were not using Panga salt, for the Panga salt was chiefly being manufactured by people of low castes, such as Keutas, Bauris, Kandaras etc.

Salt was an established industry before the British annexation of Orissa. Mr. Sterling has observed: "This Province once supplied the finest salt of all India". Salt was an important article of export by way of the great road leading along the Mahanadi to Sambalpur, Berar and Central Provinces. It was also exported to Chotanagpur through the river Subarnarekha. "The Mahanadi, literally the great river, afforded a magnificent highway for the products of Central India to the Orissa sea-board. Every year the Tributary States and Central Provinces exported large quantities of rice, grain, oil-seeds, cotton and other rural commerce to the coast in exchange for salt." In this way Orissa used to export more than 9 lakh maunds of salt annually.

(ii) *During British period.*—(a) 1803–1817—*East India Company Days.*—When the British Government took possession of Orissa in 1803, they began to organize the salt industry by introducing the monopoly system. This system was introduced throughout the Province in 1804, to the extent

of prohibiting any manufacture of salt unlicensed by the Commissioner; but the zamindars were allowed for some time afterwards to sell salt to Government at 4 annas a maund on paying a duty of annas 12 to Government and they could sell to whom-soever they pleased.

It appears from Mr. Plowden's Report that the introduction of manufacture under the exclusive superintendence of Government officers, had been gradual and some of the salt Aurungas or manufacturing localities were not opened until the year 1813, nor could the system be said to have been thoroughly organized until the year 1811.

Subsequently the zamindars were not allowed to manufacture salt. An agreement was made with them by which they received one-and-a-half anna for every maund of salt manufactured in their estates and they made over to Government their salt and fuel lands and divested themselves of all rights to interfere with the *molunghees* or salt manufacturers. Afterwards they were also allowed to have some salt for their personal use known as *Khorakee* allowance.

(b) 1817-1860.—When the Salt Department in Orissa was first brought under the control of the Commissioner in 1817, the salt Aurungas extended from the river Subarnarekha to the Devi and skirted the Chilka Lake on two sides what were termed the Khoorda Aurungas of Haridas and Bhusundi-pur being on one side and the lake Aurungas of Mallod on the other.

In most of the Aurungas of Balasore, Cuttack and Puri districts Panga salt was manufactured, but in a few of them in the Puri district Kurkutch salt was produced. The manufacture of Panga salt went on from middle of December to the end of May, under the supervision of the Aurang Daroghas. The actual manufacture was done by the contractors and their workmen. Contract rate for Panga salt varied from Re. -/5/- to -/6/- per maund. Prior to 1826 the Chilka Lake Aurungas manufactured only Kurkutch salt, and the Panga manufacture is said to have been introduced into them with much difficulty and being conditional on the fuel and the pots required being supplied to the contractors by Government. Payment to the extent of Rs. 10 per 100 maunds contracted for was made in advance prior to the commencement of operation and second instalment was paid in March or April. The price thus paid to the contractors was reckoned to afford them a profit of 25 per cent if the salt produced was 400 maunds, and less on smaller quantities.

Side by side with the extension of manufacture in Orissa and Bengal, under the exclusive supervision of the Government, the importations of Liverpool salt vastly increased. Before 1820 the East India Company imported a few consignments of Liverpool salt as trials. But by 1832 nearly two lakh maunds of salt were imported. Cheshire producers persuaded the House of Commons to examine the situation in 1836. The Select Committee of the House of Commons of 1836 recommended that the Government monopoly should be reduced to a monopoly of manufacture only and not of sale. This monopoly of manufacture was further criticised from time to time while the imports of foreign salt grew to 29 lakh maunds in 1851. The Select Committee of the House of Commons of 1853 recommended a system of Excise on Salt. The Resolution read as follows:—

“And whereas by the Act of 3rd and 4th years of William IV it was enacted that the East India Company shall with all convenient speed after 22nd April 1834 close their business and whereas the said East India Company have continued to carry on the manufacture and sale of salt from the date

of the said Act to the present (1853) time notwithstanding the aforesaid provision, and whereas it is expedient that the said salt monopoly should absolutely cease and determine; Be it enacted that from and after the first day of May 1856, it shall be unlawful for the said East India Company to continue the manufacture of salt as at present carried on by them in the Province of Bengal (Orissa was included) and that such manufacture shall absolutely cease, whether carried on by the East India Company or on account of and under the control of the said company and the manufacture and sale of salt in India shall be absolutely free, subject only to such Excise or other duties as may from time to time be levied upon such salt so manufactured."

This clause was, however, expunged by the House of Lords and its omission was subsequently agreed to by the House of Commons.

The salt manufacture was developed considerably from 1853 to 1860 according to Mr. Rundall's report on the system of Salt Manufacture and Administration in Orissa. The average quantity manufactured during these years came to about 20 lakh maunds. The surplus salt was sent to Calcutta in native crafts to the Salkia Golahs. Out of 20 lakh maunds produced about 11-12 lakh maunds were so exported.

The remarks of Mr. Parker, the Junior Member of the Board of Customs, Salt and Opium in his minute, dated as early as the 2nd November 1835, will clearly explain the position. In answer to a point raised by the supporters of the Excise system that the price paid to the *Molunghees* under the monopoly system was not remunerative and that the article could be produced cheaper under an Excise system than under a monopoly system, he said: "The price paid to the *Molunghees* is a fully remunerative price. It might possibly fall and the article may be produced cheaper under an Excise system; but the question is, how much cheaper? I do not believe that under any circumstances, even with the utmost application of European skill and industry interested in the result, salt could be made in Bengal at a lower rate than four annas or 8d. per maund. (It is said to cost 6d. per maund at the Cheshire works in England.) The price paid at present to the *Molunghees* for our dearest salt is 14 annas per maund. But the average may be assumed at 10 annas per maund. The possible difference to the consumer therefore under an excise system as compared with our present monopoly would be the difference between 4 annas and 10 annas, *i.e.*, 6 annas per maund; which assuming that a grown up man consumes 6 seers or 12 lbs. (seer of 82 tolas) per year would reduce his expenditure for salt not quite 11 pies in 12 months, that is to say less than a pie per month. So it appears that the arguments advanced in favour of the *Molunghees* and consumers are more apparent than real."

Every experienced administrator spoke of the hardship that would occur to the villagers working in the salt producing zone. In fact the then Government of Bengal adduced that view as would be evident from the following extract from the letter No. 685 of the Board of Revenue republished in Mr. Plowden's report. "This state of things, so injurious to the home-producer and to the industrial interest of the country, appears to the Board to demand close enquiry, and if possible the application of a remedy. The discontinuance in any district of a manufacture in which thousands of persons have been engaged all their lives, and from which they have derived large portion

of their subsistence, is a most serious calamity, which the Government is bound to avert by every possible means consistent with the maintenance of revenue derived from salt and with fairness to the foreign importers."

"The fact that the Government is precluded from deriving profit from the purchase and sale of salt and that it is not interested in maintaining the manufacture, and the equally certain fact that it is the Molunghee alone, and not the Government who suffers by the discontinuance of the home-manufacture, and benefits by its extension are, in the Board's opinion, altogether inconsistent with the position which for the sake of argument, has been supposed by the supporters of the excise system in England."

Lord Dalhousie, who was at that time, the Governor of Bengal, in his minute, observed in favour of the continuance of the monopoly system for the good of the Indian salt manufacturer. His observations as quoted in Mr. Plowden's Fourth Report, 1853, Appendix P, run as follows:—

"The representations of the Revenue Board, in my humble judgment have established that, under the existing system, no injustice is done to the importers of salt from without, or to the producer of home salt in India.

"Necessity may unfortunately compel this Government for the present, to continue to raise an objectionable impost upon an article of first necessity, but nothing can justify the Government in pursuing for this purpose, a system which unduly exposes a portion of its people to disadvantages that are rapidly depriving them of their means of livelihood. It is therefore, I think the plain duty of the Government to endeavour to remedy this evil at once, in the mode pointed out.

"Lastly if it should be objected that this revisal of the selling price of native salt in India will create remonstrances and raise clamour among the owners and exporters of salt from England to India, the answer is easy; the act of the Government here can be shown to be founded on justice and necessity; any clamour against it in England, therefore, will have no foundation in justice or reason, and accordingly it ought to be, and safely may be disregarded."

Mention has already been made under Bengal about the appointment of Mr. Plowden as Commissioner to go into the question of salt industry in Bengal, including Orissa. As stated he recommended introduction of the Excise system but disfavoured the idea of sudden abandonment of the Monopoly system. He suggested a slow and gradual extension of the Excise system. Several British officials of the Bengal Civil Service pleaded for the continuance of the Monopoly system in the interest of salt manufacturers of Bengal and Orissa. The idea behind the introduction of this system was to safeguard the revenue and to provide labour to keep up the good economic condition of the poor people of the saliferous tracts.

(c) 1860–1870.—The abolition of the salt Monopoly system virtually meant the extinction of the salt industry. Imports gradually increased and amounted to about 37 lakh maunds in 1861. Imported salt of superior quality began to sell at a lower cost than the indigenous salt and so the indigenous industry could not stand in competition. As Government stocks were very large, the Government had to limit the manufacture of salt in Orissa to 5 lakh maunds only. The Molunghees' rates also were lowered.

It appears from Mr. Rundall that the salt agents of Puri, Cuttack and Balasore, reported that while the Government stocks lasted (for which manufacture was at first contracted and then altogether stopped) private individuals were unlikely to embark on excise manufacture. By their letter No. 1381, dated 17th April 1863, the Government called upon the Board to report as to the expediency of prohibiting the future extension of local manufacture under Excise and of depending entirely on foreign importations of salt. The Board in their letter No. 495, dated 4th June, 1863, held it to be premature to entertain the question, and considered it "desirable that the landholders in the producing district should be left, for a time at least, to avail themselves of the privilege" but if it should "be found, the lands are turned rather to purposes of cultivation than to production of salt, it may then be time to enforce such prohibition". The then Commissioner protested against this proposal in the following terms:—

"As a matter not only of general policy but of common justice to the people of the Province, I would give them every reasonable facility for undertaking the manufacture and I have not a doubt myself that eventually not in Puri only but in Cuttack and Balasore advantage will be taken of the permission. If the manufacture were prohibited, as suggested by the Government or by the Board of Revenue the question of compensation to the salt Zamindars would at once revive and in a most impracticable shape. But this would not be the worst of it. In the Kurkutch tracts it would be simply impossible to put a stop to illicit manufacture were no licit manufacture allowed to exist. We should be fighting against nature and the cruelty, the demoralization that would result I shrink from contemplating."

The limitation of salt production in Orissa coast after 1863 brought great disasters in its wake. The great famine of 1866 also took its great toll of the salt producing class.

(d) 1870-1930.—Apart from the trouble arising due to the high rate of duty and the high cost price due to extra charges as shown above there was also the administrative difficulty. By 1880 the industry became extinct in Bengal and lingered uncared for only on the distant coast of Orissa. "It is not improbable" said Pandit Gopabandhu Das "that the Bengal officers did not like the continuance of the industry in an extreme and by no means attractive corner of the province, and for want of strict supervision the excise system which was then working did not prove a success". The Salt administration in Orissa was consequently transferred to the Salt Department of Madras. "This is" as Pandit Gopabandhu also observed "but another instance of how the Orissa shore has often been used as a ground for administrative experiments". It would hardly be expected that the industry would prosper under Madras. "The Orissa factories" observed Pandit Gopabandhu Das "lying as they did at the tail end of the jurisdiction of the Madras Salt Department and outside the Presidency, did not receive proper supervision and care from the Madras officers who naturally attended more to factories situated in the Presidency under their immediate supervision". In their Resolution No. 130 of the 25th March 1891, the Madras Board of Revenue stated "The Deputy Commissioner regrets to observe that ignorance of Oriya on the part of the departmental officers is one of the practical difficulties in the way of the successful working of the system of direct manufacture in Tua". (Tua is in the Chilka.)

With the object of more effectively preventing illicit manufacture the administration of the Salt Department in Orissa was transferred to the Madras Board of Revenue in 1886-1888 and Act XII of 1882 was extended

to the Province. The administration of the Salt Department in Orissa was, however, retransferred to the Bengal Board of Revenue on 1st October, 1897. Enquiries, which were initiated about the same time, showed that salt was illicitly manufactured in a considerable extent in the saliferous tracts in the coast districts of Bengal as well as in Orissa. A local Salt Department was accordingly formed for the suppression of this manufacture in Orissa. The opening of the East Coast Railway greatly increased the facilities for the importation of Madras salt and the Madras salt nearly ousted salt brought from Calcutta in the district of Cuttack and proved itself a great competitor in places where for many years salt from Europe enjoyed a complete monopoly.

Panga Salt.—Salt was largely manufactured in parts of the sea board in Bengal including the present State of Orissa. It was of two kinds, 'Panga' and 'Kurkutch'. Panga salt was educed by boiling brine obtained by artificial heat and so fuel was necessary. Clear brine was boiled in small pots and impurities were removed as they rose to the surface. There was much wastage of fuel and the cost of production was fairly high. Panga salt was manufactured mostly in Balasore and Cuttack districts. The East India Company purchased salt from the 'Molanghees' at Re. 0-8-0, Re. 0-12-0 Re. 0-14-0 a maund according to agreements. In 1835-36 salt was manufactured by private individuals, but it had to be sold to Government. Manufacture for sale to the public was permitted in 1847 under a system of licence. In Orissa a large quantity of salt was produced. The competition of Madras and foreign salts, however, ultimately proved fatal to the local industry. With increasing competition the manufacture of this salt under an excise system became unprofitable. Moreover, forests were gradually exhausted and fuel was not easily obtainable. The Zamindars were very exacting as regards charges of rent for removal of salt earth from their estates and for the extracting of fuel from their forests. So the manufacture by Panga method no longer proved remunerative and was abandoned in 1889.

Kurkutch.—Kurkutch salt was obtained by evaporation by solar heat of brine obtained from the sea or from backwaters or lagoons communicating with the sea. This method prevailed in the neighbourhood of Chilka lake at the extreme south of Orissa. The East India Company's monopoly was gradually abolished and replaced by Excise system by 1863. The Excise system which produced about 70,000 maunds was abolished in 1891 and the Monopoly system revived, since under the strict control exercised by the Madras Salt Department manufacture of Kurkutch salt under Excise system ceased to be profitable. There were two Government factories, one at Tua in Puri and the other at Sartha in Balasore and subsequently a third at Gurubai in the Puri district. The latter was designed to enlist the co-operation of the Parikud Raja and to improve the condition of his ryots. Even manufacture by this cheaper method was, however, handicapped (1) by the weakness of brine and (2) by the thunderstorms to which this part of the coast is subject. When the opening of the East Coast Railway intensified the competition of Madras and Liverpool salt, the Orissa salt was unable to hold its own. By 1893-94 the production had dropped to 19,000 maunds. The Sartha factory was closed in 1893 and the Tua and Gurubai factories in 1897-98. In 1901, and again in 1908, the question of reviving the manufacture of salt in Orissa in the interests of the classes to whom it had previously afforded employment, was carefully considered by the Board of Revenue and Government and found to be impracticable. During the war, the question assumed a new importance. The high prices that prevailed then naturally rendered the prospects of reviving the industry much more favourable and the commercial aspects of such a revival were

investigated by two or three firms. In particular, Mr. F. W. Gooch, formerly of the Madras Salt Department, studied the question at the instance of Messrs Kilburn and Company and Tata and Sons. His conclusions were that the revival of the manufacture by the Panga process (artificial heat) was quite impracticable but he thought that the revival of manufacture by the Kurkutch method (solar evaporation) on the Chilka Lake promised success. With the termination of the war, however, the firms interested seemed to have been satisfied that the conditions that alone could render the project a financial success no longer existed and they took no further steps in the matter. It was, however, further investigated by the Director of Industries, Bihar and Orissa, who came to the conclusion that unless the quality of brine in the Chilka Lake could be improved, a point which will be dealt with more fully below, "to attempt to make salt there would be madness." Revival of the Panga method of manufacture was rejected by him, like all those who had studied the question, as quite impracticable. At the end of 1921, however, certain persons in the Balasore district asked to be allowed to start manufacture by the Panga system. This was investigated by the Director of Industries who pointed out that owing to the fall in the price of salt and difficulty of obtaining fuel it was practically certain that honest manufacture by this method could not prove profitable. While the matter was under the consideration of Government, the price of salt fell still further so that even on the figures prepared by the promoters of the scheme the manufacture was bound to result in a loss. They calculated the total cost of manufacture (including Duty at Rs. 1-4-0) at Rs. 2-9-1½ per maund. They hoped to sell at Rs. 3-2-0 per maund wholesale and thus to make a profit of over 8 annas a maund. The wholesale price of salt in Orissa during the month of December 1924, was, however, Rs. 2-7-10 per maund. There was no reason to suppose that the cost of manufacture had fallen. Obviously, therefore, even on the figures furnished by the promoters, which were more likely to have been optimistic than the reverse, there was no margin of profit. In short, the manufacture of Kurkutch salt in Orissa was only profitable so long as it was protected against Madras salt and imported salt by bad communications, and in part by the prejudice against imported salt which has largely died out. It was the opening of the Railway that really dealt a deathblow to it. Natural circumstances are also unfavourable. The climate is humid, and the early thunderstorms already mentioned shorten the working period. There appears to be no reason to doubt that just above the Chilka Lake there is for some reason a line on either side of which the climatic conditions are materially dissimilar. As stated by Mr. (subsequently Sir) Krishna Gupta, who had considerable local knowledge, and reported on the subject in the capacity of Commissioner of Orissa to the Commissioner of Salt and Excise, Bengal in 1901, the early "nor wester" in March and April was apparently one of the reasons why the Panga system of manufacture (which is not like the Kurkutch system dependent on the weather) prevailed north of the Chilka Lake. He ascribed to the same cause the failure of the Government factory at Sartha in Balasore which had to be closed in 1893. He said this "only confirmed the previous experience that no Kurkutch, was ever known to have been made beyond the northern confines of the Chilka". The Madras Salt Commission of 1876 also pointed out that statistics showed that in the previous ten years there had always been rain in June in Puri,—over 10 inches in four of those years, and in one no less than 23·71 inches. They said "the season is thus at the best of times no longer than 3 months and always precarious". Mr. Le Mesurier, speaking in the Bihar and Orissa Legislative Council said "In the Chilka, the thunderstorms of April and May repeatedly retard and destroy manufacture. In consequence, the most shallow form

of irrigation was resorted to in the Chilka in order that the salt might be gathered in the interval between thunderstorms. The brine which was admitted into the crystallizing beds was only the amount which was sufficient to cover the ground and there was hardly sufficient liquid left to carry away the magnesium salts", and this again adversely affected the quality of the salt. The Director of Industries, Bihar and Orissa, in his Report for 1920-21 said "the northern limit of this (Kurkutch) process of manufacture is the Chilka lake itself since the rest of the coast of Orissa is subject to cyclonic storms at all times of the year". It should be remembered in addition, that the manufacture of the ordinary bay salt—salt educed from sea-water by solar evaporation—is impracticable at the head of the Bay of Bengal because the salinity of the sea-water there is much lower than on the Madras coast where this is the ordinary method of manufacture, owing to the enormous discharge of fresh water from the rivers of the Gangetic and other systems. The sea-water apart from its low salinity is also unsuited for the manufacture of salt owing to the large amount of impurity in the form of silt that it contains.

(e) 1930-1950.—Mention has been made of the efforts to revive the salt industry in Bengal, including Orissa under the Bengal chapter, and of the report of the Taxation Enquiry Committee, examination by the Central Board of Revenue, appointment of the Tariff Board, appointment of the Salt Survey Committee and that of Mr. C. H. Pitt of the Northern India Salt Revenue Department. Mr. Pitt enquired into the possibilities of revival of the salt manufacture in Bengal and Orissa coasts. He overruled the possibility of production by the Panga method, but recommended the revival of solar manufacture on the Chilka lake where he estimated that an output of 22 tons (600 mds.) per acre per annum could be obtained. His references to the unfavourable climatic conditions, the surprising statement that no record was available to show that salt was ever manufactured on the coast of Bengal and Orissa, and other considerations such as competition from Madras and foreign salts, tended to make his report unfavourable to the revival of the salt industry in Orissa.

In 1938, after the formation of the Orissa province, the Government of Orissa set up a Committee to explore the possibilities of the establishment of a salt industry in the coastal areas with special reference to Astrang in the Puri district, and to recommend the method of manufacture which could be adopted. The Orissa Government, in setting up this Committee, were influenced by the recollection of the fact that the salt industry flourished in the province till 80 years ago and salt was actually being exported from Orissa to the adjoining provinces. The Committee gave the following views:—

"For successful manufacture of salt by solar evaporation two conditions are necessary: (i) climate and (ii) physical features of the locality to be selected for salt culture. Both the factors are so important that the success of the industry directly depends on close fulfilment of the conditions therein. The climatic conditions depend mainly on the following factors:—

(1) Rainfall, (2) humidity, (3) direction and velocity of wind, (4) average temperature, and (5) number of days in which evaporation can take place and the length of these days."

The Committee further observed:—

"The physical conditions of the locality where salt is to be manufactured may be studied under the following heads:

(1) Distance of the site from the sea, (2) area, situation and surface of the site, (3) soil conditions of the site, (4) availability of good brine supply, (5) conditions of labour supply, (6) transport and market facilities."

They also thought that the conditions under which salt was being manufactured in olden days had changed and salt factories were a necessity to provide labour to the poor people in Orissa. They suggested starting of experimental factories both for Panga and Kurkutch salt in Balasore and also starting of factories in Tua and Gurubai. The Committee was further of the opinion that it was possible to manufacture salt in Astrang and other coastal areas of the province. It preferred the solar evaporation method to the Panga method and recommended that for the re-establishment of industry, the Government of India should forego a portion, Rs. 6-12-10 per ton (Re. 0-4-0 a maund) of the salt duty in the early stages of its revival. They added that a new factory between the villages Astrang and Timur on an area of about 3,000 acres could be started. According to the Committee the soil of the locality is rich and the initial density of the brine which varies from 2.5 to 6 degrees Be' is suitable. They calculated a capital investment in a factory of about 200 acres at Rs. 2,500 only. The salt from Astrang could be carried by boat to Cuttack during the flood season. They also suggested to the State Government to take the position of a private licensee. If the Government did not think it advisable to take up that position a Co-operative Society could be formed or individual capitalists or joint stock companies could be given licenses. Salt could also be manufactured under cottage industry method. In 1947 the Government of Orissa invited Rai Bahadur Shiv Charan Das, who was at that time the Salt Adviser to the Government of India, to pay a visit to Orissa and examine the possibilities of increasing the production of salt in the province. Rai Bahadur Shiv Charan Das submitted his report in July, 1948.

Orissa Investigation Committee's views.—In May, 1948 the Government of Orissa appointed a Committee known as the Orissa Salt Manufacture Investigation Committee, to conduct a proper investigation of the salt industry in Orissa. This Committee was asked to suggest suitable locations where salt could be conveniently manufactured, to ascertain the most suitable type of installations and the kind of organisation required for the manufacture of salt. The Committee came to the following conclusions:—

There is no possibility of starting salt factories on the Balasore coast on an economical and commercial basis either by solar evaporation or by the Panga process due to unfavourable weather conditions and lack of fuel. As regards Cuttack, they stated that at Bhopal on the border of Kanika 1,000 acres of land are available and will be suitable for manufacture of salt. They also suggested another site at Harispur where salt could be produced at an economic cost and another place at Kharnasi and Bailkani situated near the mouth of the Mahanadi. As regards Puri the Committee mentioned about the Astrang Salt Production and Sale Co-operative Society which is now working in a small area of 250 acres. They noticed the difficulty of adequate brine supply and the difficulty of transport. They suggested an area of 300 acres available near Astrang for development. As regards Chilka lake, their view was that the development of the salt factory will have to wait till an artificial opening is made and the mouth of the lake end is kept open in connection with some other development scheme. Without such a mouth connecting the sea it is not possible to manufacture salt on a commercial basis. As regards Ganjam and Sumadi

they narrated the difficulties of inadequate brine supply, etc. In regard to Sumadi they mentioned that an area of 1,000 acres waste-land is still lying and is fit for salt cultivation.

The Salt Experts Committee generally agreed with the views of the Orissa Salt Manufacture Investigation Committee. They stated that large scale manufacture of salt could not be undertaken in Balasore or Cuttack districts and that the Astrang factory should be realigned and no new salt works should be established at the Chilka until the prospects of the Hira-kud projects were fully determined. They also recommended the realignment of the Humma and the Gokurkuda Co-operative Societies factories as well as the salt works in Sumadi.

One important factor that has helped the Orissa salt industry is that the Ganjam district, which formed part of the Madras Presidency got merged into Orissa when this province was formed. This district has several established factories, such as, Humma, Sumadi, Surla, etc. These factories produce about 7 lakh maunds of salt.

B.—PRESENT SALT FACTORIES IN ORISSA

There are the following five salt factories in Orissa:—

(1) Astrang, (2) Ganjam (Humma), (3) Goka (Gokurkuda), (4) Sumadi, and (5) Surla.

A brief description of these factories is given below:—

Astrang.—The Astrang Salt Factory is managed by the Astrang Salt Production and Sale Co-operative Society and was started in 1943. It has a share capital of Rs. 4,000 but has been able to invest a further sum of Rs. 25,000 granted to the Society as loan by the State Government. The Society has about 450 members of whom about 300 are actively engaged in the salt production and work in groups of 5-6. The Society has an area of about 570 acres out of which only about 350 acres are fit for salt cultivation and the rest is undeveloped and is covered with bushes and scrubs. This can also be brought under cultivation after levelling. The factory lands are subject to floods which are always a constant threat to the factory. The brine is drawn from the creek and is lifted by manual labour. The factory follows single irrigation system. The average production of this factory is about 40,000 maunds per annum. In addition to the Society, there are a large number of small producers who are not members of the Society. They also produce quite a large quantity of salt. The salt generally finds a market in Cuttack, Jeypore and Puri districts.

The following four factories are located in the Ganjam district:—

Humma, Gokurkuda, Sumadi and Surla.

The lands under salt cultivation in this district belong to the Central Government and have been leased to different lessees, the ground rent in Humma being Re. 1 per acre and in Sumadi Re. 0-8-0 per acre. The Humma factory is the oldest and has been leased out to 27 licensees, the maximum area to a single lessee being 105 acres and the minimum as low as 2½ acres. Each licensee has his own reservoir, condensers and crystallisers. Brine is obtained from the Chilka canal. The bigger lessees have installed their own pumps while the smaller lessees use manual methods. The salt is scraped from end of March till the end of June.

The Gokurkuda factory is run by the Humma Salt Production and Sale Co-operative Society. It lies adjacent to the Humma factory. The factory, though started in 1942 did not start cultivation till 1946. The land has been leased out by the Government of India on 25 years lease and the total area was 283 acres, but an additional area of 305 acres was granted later on. The total subscribed capital is Rs. 22,500 and the State Government has granted a loan of Rs. 58,000. The Society has a membership of about 450 and they have formed themselves into groups of 5-6 members, the total number of such groups being 69 and the total production is about 65,000 maunds. Each group has its own reservoirs, condensers and crystallisers. The brine supply is from the Chilka canal.

The Sumadi factory has an area of about 5,000 acres. There are two old licensees in this factory, that is, Messrs B. K. Naidu and others and Mr. M. M. Yusuf. The third lessee are the National Chemical and Salt Works who have been allotted an area of 510 acres. The two old licensees originally had an area of 692 acres and were allotted 300 acres each for extension. Brine supply in this factory is direct from the sea and has to travel an area of about 4 miles through channels over swampy ground. By the time brine reaches 28 Be' very little of it remains and the salt is practically scraped from dry bed with the result that lot of clay is also collected along with the salt.

The Surla factory is managed by the Bahuda Salt Production and Sale Co-operative Society which was started in 1950 and was assigned an area of 283 acres. The Society has 121 members and the subscribed capital is Rs. 5,600. They have obtained a loan of Rs. 42,800. The Society has 34 groups having 4 members in each group cultivating an area of 3-4 acres. The present production of this factory is about 45,000 maunds per annum.

The production figures for the last five years of the different factories in Orissa are given below:—

Name of the factory	1950	1951	1952	1953	1954	1955
Astrang . . .	28,000	24,000	27,000	66,000	49,000	62,000
Humma (Ganjam) .	413,000	315,000	511,000	553,000	368,000	4,08,000
Gokurkuda (Goka) .	95,000	66,000	160,000	167,000	67,000	1,11,000
Sumadi . . .	356,000	513,000	217,000	381,000	178,000	2,47,000
Surla . . .	3,000	90,000	89,000	214,000	45,000	77,000
TOTAL . . .	898,000	1008,000	1005,000	1381,000	707,000	9,05,000

Establishment of Model Factory at Sumadi

The Salt Experts Committee had recommended the establishment of a model factory at Astrang (Orissa) but the Orissa Salt Development Sub-Committee did not consider it a suitable site due to poor transport facilities. The Sub-Committee suggested the sites at Sumadi, Ganjam and Gokurkuda as more suitable. The local officers thought that Humma would be better as this is the Headquarters of the Superintendent. They, however, pointed out that the difficulty was that some lessees' land will have to be resumed

The possibility of having the model factory at Sumadi was, therefore, examined. An area of over 200 acres was lying fallow and was far away from the platforms but adjacent to the area of a respectable lessee, Dr. Rao. He was anxious to have it with a view to extend his factory. The Salt Department decided that Dr. Rao should be requested to let them have a piece of land (about 60-70 acres) from one of his factories near the platforms. Dr. Rao agreed to release about 60-70 acres of land from his factory and also a portion from his platform. The factory is estimated to cost about Rs. 40 lakhs and is expected to start functioning shortly.

The quality of Orissa salt is poor and it is hoped that with the establishment of this model farm, Government will be able to demonstrate to the private manufacturers how good quality salt can be produced, as the Wadala Model Farm has done in Bombay.

Co-operative Societies

It is a special feature in Orissa only that salt manufacture has been taken up by Co-operative Societies. These Societies consist of working and non-working members. The working members form themselves into groups of five to six and work on three to five acres of land for salt cultivation. The non-working members contribute to the share capital of society and are entitled to the dividends that may be declared from the profits. The Orissa Government favoured the extension of salt manufacture by co-operative societies. The Salt Experts Committee also favoured this idea, but made the following suggestions:—

“While non-working members should not be excluded from the membership of the society care should be taken to see that the number of such members who are merely financiers is not increased merely to obtain additional capital. The inclusion of non-working members is desirable only if their service could be utilised for the purpose of guiding the affairs of the society. The Co-operative Societies are primarily organised for the benefit of those members who actually work on salt cultivation and they should not be converted into avenues of investments for the non-working members.”

Though the Societies work both as producers and distributors of salt, the members at present restrict their coalition in the sale of salt alone. In the process of manufacture too, if the members work jointly *viz.* supply of brine by common pumps, concentrating brine up to 23° Be' in common reservoirs and condensers under scientific control, adoption of common protective measures against flooding, proper maintenance of works and common stores, they will consequently get the benefit of improved efficiency and economy. The cost of operations can be reduced if they are carried out jointly on a larger scale rather than in small individual units. Many of the members can be gainfully employed if they were assigned definite duties.

The Orissa Government should offer the co-operative societies easy loans and other financial help to meet the cost of laying out the works on proper scientific lines. The Salt Department is also considering grant of such assistance.

C.—DISTRIBUTION

Orissa State requires about 26 lakh maunds of salt per annum for its own requirements, out of which the State produces at present about 10-12 lakh maunds only. Prior to and after the introduction of the Zonal scheme

for distribution of salt, which was introduced from 1-1-1949, the State used to obtain her requirements up to 1950 from Orissa, Bombay, Naupada (Andhra) and Calcutta salt sources. The statistics of supply from each salt source to the State during 1948-49 to 1955-56 are given below:—

(Figures in '000 maunds)

Salt Source	1948-49	1949-50	1950-51	1951-52	1952-53	1953-54	1954-55	1955-56
1. Orissa	6,41	7,20	9,69	9,85	8,07	10,61	9,24	10,57
2. Madras	8,49	10,29	10,67	9,93	10,90	99	..	11,00
3. Andhra								
4. Bombay	24	1,09	70	1,24	1,85	1,73	..	..
5. Calcutta	2,30	5,82	11	..	..	39	7	..
TOTAL	17,44	24,40	21,17	21,02	20,82	13,72	9,31	21,57

When the Zonal scheme was introduced in 1949 the Orissa factories had been included in the Madras Zone, *viz.*, in Naupada Zone in 1949 and 1950 and in North Madras Zone (which included Naupada) in 1951 to 1953. Since 1954, Naupada etc. of North Madras zone came in Andhra zone (after formation of Andhra as a separate State). The supervision work with regard to Zonal distribution of Orissa factories was placed under the Deputy Salt Commissioner, Madras, up to 1951, though the administrative control of these factories was with the Assistant Salt Commissioner, Calcutta. Since 1952, both the above works were, however, placed under the Assistant Salt Commissioner, Calcutta. In 1949 the Orissa State was attached to Orissa, Naupada (Andhra) and Calcutta salt sources under the Zonal scheme; in 1950 to Orissa, Naupada and Bombay sources and in 1951 to Orissa and Madras (Naupada etc.) sources. Since 1952, the State has been attached to Orissa and Madras (now Andhra) sources only under the Zonal scheme. At the request of the State Government, supplies from Calcutta under the Zonal scheme had been suspended since 1950, and from Bombay since 1951. This suggestion was made by the Orissa Government in order to safeguard the interests of their own salt manufacturers.

Orissa is not self-sufficient in salt and can hardly meet half its requirements. It has, therefore, been necessary to arrange for supplies from outside. Of the outside sources, the State Government prefer salt from Naupada source only, as the quality and prices of this salt are almost similar to their own salt. During 1950, Bombay salt was, however, allowed to be marketed in Orissa with the consent of the State Government. As large quantities of this were moving to the State from Bombay, the Orissa Government strongly opposed further entry of Bombay salt, and since then it has been suspended. But the Bombay manufacturers have been demanding a market on the ground that their salt is liked in the State, especially in the Sambalpur district. No provision of salt is made from Bombay in the Zonal scheme since 1952, but large quantities are imported into the State by rail under "Ordinary traffic".

In order to encourage the Orissa manufacturers to create a market for their salt in areas outside their own State, some provision was made in the Zonal scheme of 1951 allowing them markets in Ranchi, Hazaribag, Manbhum and Singbhum districts in Bihar in addition to their own State, but they failed to sell any salt in these districts, as such these outside markets were withdrawn in the subsequent Zonal scheme. It has been noticed that Orissa salt cannot compete with other indigenous salts even in their own State. This drawback is due to poor quality and higher price of Orissa

salt. It will not be out of place to mention here that the Hon'ble Shri Harekrushna Mehtab, the then Minister in charge of Industry and Supply, who addressed the Salt Advisory Committee meeting on 14-11-1950, stated that quality of salt should be improved considerably. Bombay salt was coming to Orissa as it was of better quality. He suggested various measures to see that the quality is improved. These views were placed before the Orissa Government and a sub-committee consisting of the Salt Commissioner and representatives of Orissa Government and Orissa salt manufacturers was formed to examine the question of both increasing production and improving the quality of salt. If the above two objectives could be achieved by the Orissa manufacturers, they would not only be able to make their State self-sufficient, but would also be able to extend their market to other States.

The existing Zonal scheme for Orissa salt as well as for supply to Orissa as included in Calcutta and Andhra Zones is as follows:—

(i) *From Orissa Salt Sources (Calcutta zone)*—The B. G. stations on the Eastern Railway within the Orissa State including N. G. off-shoots. Booking to Orissa from Calcutta source is restricted.

(ii) *From Andhra Zone.*—To B. G. stations on the Eastern Railway (a) commencing from Vizagapatam and completing the circuit viz. Vizagapatam, Raipur, Bilaspur, Jharsuguda, Sini, Kharagpur and Cuttack including the N. G. and B. G. off-shoots on the above route with the reservation that no booking shall be allowed to stations between Jhaleswar and Chakuli *via* Kharagpur etc.

Under the Zonal scheme all supplies to the stations of Cuttack, Puri, Dhenkanal and Sambalpur from Andhra Zone have been completely banned since 1954.

The Zonal scheme of distribution applies to movement of salt by rail only for "preferential traffic" and not for movement by road, river and sea. However, there is no restriction on the movement of salt by rail from one zone to another under "Ordinary traffic".

Below is a statement showing supply of Orissa salt to different district in and outside the State since 1949.

Name of District	Supply (in '000 maunds)						
	1949	1950	1951	1952	1953	1954	1955
1. Cuttack	151.9	186.6	306.0	243.5	200.8	236.7	275
2. Puri	64.3	77.5	123.8	116.4	112.2	139.7	204
3. Balasore . . . . .	..	..	..	..	..	..	..
4. Sambalpur	88.3	43.3	193.6	80.8	117.0	76.7	50
5. Ganjam	295.3	363.6	394.2	332.8	385.3	364.2	..
6. Koraput . . . . .	..	..	..	..	..	0.5	..
7. Keonjhar . . . . .	..	..	..	..	..	..	..
8. Dhenkanal	42.0	90.4	161.4	130.1	113.2	143.9	178
9. Balanjir Patna . . . . .	..	..	51.3	..	..	1.5	..
10. Kalahandi . . . . .	..	..	..	..	..	1.0	1
11. Sundargarh . . . . .	..	..	..	..	..	0.5	..
12. Phulbari . . . . .	..	..	..	..	..	..	321
13. Mayurbhanj . . . . .	..	..	..	2.9	..	..	..
Total	641.8	761.9	1233.2	103.6	928.5	964.7	1029
Vizagapatam (Andhra)	40.7	58.2	60.2	30.3	52.8	44.7	55

(The above figures do not include supplies made by the unlicensed manufacturers.)

PREVENTIVE MEASURES

The great bulk of salt consumed was received from outside and was easily and cheaply taxed at the ports of entry. In the interior of Bengal, preventive measures were in the hands of the Commissioner of Excise and Salt under the local Government. Till 1930-31 the Excise staff used to patrol the saline tracts and destroy the spontaneous salt whenever it was found. The Delhi Pact of March 1931, however, permitted local residents in villages, immediately adjoining areas where salt can be made or collected, to collect or make salt for domestic consumption or for sale within such villages, but not for sale to or trading with individuals living outside them. In accordance with this agreement, the preventive officers stopped from interfering with the manufacture of salt by villagers in saliferous areas or its sale by them in neighbouring markets or bazaars. But an abuse of the concession was inferred when salt was removed in carts or by means other than on foot. On an average 175 cases were detected in a year.

The increase in the number of cases in 1930-31 was due to the political campaign against the salt tax, followed by the Delhi Pact, which accounts for the sudden drop since 1931-32. There were flagrant abuses of the salt concessions since 1933-34 and cases of smuggling of non-duty paid salt appeared to be on the increase.

In Orissa the preventive work in the saliferous districts of Cuttack, Puri and Balasore was under the Commissioner of Salt and Excise. The prohibitory orders of the Government of India against prosecuting people collecting or making salt in areas adjoining the villages in which they reside for their domestic consumption are in force. In general the concession has not been much abused.

In the district of Puri abuse of the concession was reported particularly in Astrang area. Additional preventive staff including Sub-Inspector of Excise and Salt, Petty officers and peons were posted for which an additional contribution of Rs. 7,000 was sanctioned by Government of India. The staff were actively engaged in preventive work in the saline areas of Puri and Cuttack districts bordering the Devi River with its innumerable branches and creeks. There was a patrol post consisting of a Sub-Inspector, Petty officer and peons at Satpara Island inside the Chilka Lake for preventive work in the Lake area. The important markets and road crossings were also guarded by the preventive staff. But the topography of the saline areas is such that effective control was not possible. The smuggling of salt increased with favourable weather conditions for manufacture in the year of drought and scarcity. The saline areas of Cuttack and Puri districts exploited the pact concessions to an abuse. The Superintendent of Excise and Salt of the district used to look after salt preventive work under the Revenue Excise Commissioner of Orissa up to 1943. The Central Excise Department took over charge of Salt and other Central Excises from the province in 1944. The Assistant Collector, Central Excise stationed at Puri began to look after the work. So long as there was salt tax the staff existed but since the abolition of Duty in April, 1947, there has been no salt preventive staff.

In 1948 when the all India Salt Organisation was formed the Salt Controller took charge of all matters relating to salt in Orissa. The Assistant Salt Controller (now Commissioner) stationed at Calcutta and a Superintendent of Salt at Humma in the district of Ganjam, supervise the

salt work in the State on behalf of the Salt Commissioner for India stationed at Delhi. There is no preventive work now as the manufacture of salt under 10 acres of area has been made free without a licence and the salt cess is realised at the source of manufacture from the licensed factories.

E.—HISTORY OF ADMINISTRATION

In the times of the East India Company the Board of Revenue controlled the Salt Department. Government depots, storehouses and Excise Golahs existed side by side with private inland bonded warehouses. In 1887-88 the administration of Orissa was transferred from the Government of Bengal to that of Madras to prevent illicit practices rampant at that time. Illicit manufacture of salt then increased in the maritime districts of Bengal and towards the end of 1897 a separate Salt Department for Bengal was created with administrative and preventive staff. The factories in Orissa were closed and preventive work again handed over to this Department. The control of the saltpetre refineries in Bengal was also transferred from the Northern India Salt Revenue Department to the Bengal Government in 1901. About 1935 the salt golahs in Bengal other than the inland bonded warehouses were administered by the Central Board of Revenue through the Collector of Customs, but matters relating to inland preventive work, control of inland bonded warehouses, control of saltpetre refineries and soda factories and remission of duty on salt including educed salt used for industrial purposes and manufacture of salt were administered by the Government of Bengal through the Collectors of districts and the Commissioner of Salt and Excise. For this work the Bengal Government used to get an annual contribution from the Central Revenues.

Separate province of Bihar and Orissa was created in 1912. At that time the Commissioner of Salt and Excise, Bihar, took over charge of the preventive operations in the three saliferous districts of Cuttack, Balasore and Puri. The control of these operations then passed to the officers of the separate Government of Orissa.

The Government of India Act, 1935, created a separate province of Orissa, including the ceded districts of Ganjam and Keraput of Madras Presidency. The Revenue Excise Commissioner of Orissa remained in charge of all Central Excises including Salt in the three coastal districts of Balasore, Cuttack and Puri. He had under him Superintendents in charge of districts with necessary subordinate staff. But the control of Salt Revenue in the district of Ganjam still remained under the administrative control of Collector of Salt Revenue, Madras. Only in the year 1944 when the centralisation of all Central Revenues was introduced, the Collector of Central Excises, Calcutta, took over charge of all Central Excises including Salt of the Province of Orissa. The Salt administration of Ganjam district came over to the Collector of Central Excises, Calcutta and the Madras staff stationed at Ganjam and Sumadi factories were returned to the Collector of Central Excises, Madras and the records were bifurcated. The Assistant Collector of Central Excises stationed at Puri remained in charge of the Salt factories in Orissa under the Collector of Central Excises, Calcutta. Subsequently, when the present Salt Organisation was formed in 1948, and the Assistant Salt Controller's Office at Calcutta was started in September 1948, the Salt administration in Bengal and Orissa came over to the Salt Controller for India. Now there is one Superintendent of Salt stationed at Humma for Orissa State who supervises and controls manufacture and distribution of salt in the State of Orissa. He works under the direction of the Salt Commissioner through the Assistant Salt Commissioner, Calcutta.

CHAPTER XI

RAJASTHAN SALT SOURCES

A.—SAMBHAR LAKE

(a) *Historical*.—The term Rajasthan formerly known as Rajputana signifies a great territorial circle which includes 19 of the former Indian States. The whole of Rajasthan is saline in character. There are a number of depressions capable of producing salt. The most important of all these is the Sambhar Lake.

Though Sambhar is not mentioned as such in the Epics, the place is very ancient and can be recognised by association. There is mention of Raja Yayaat in the Mahabharat, who married Devyani, the daughter of Shukracharya, the high priest of Brishparva, the King of the Demons. In the Adi Parva of Mahabharat, details of the battle between the demons and the gods are given. It appears that this place was the capital of the King of the Demons, Brishparva. He secured the services of Shukracharya to guide him. There is the description of Devyani's marriage with Raja Yayaat, who was the Emperor of Bharat Varsha, tenth in the line of descent from Brahma. We can thus calculate the ancientness of the place from this incident. It takes us about 5,000 years before Christ. The place is thus as ancient as civilization itself. The story of Devyani is repeated also in Bhagwat Puran in the 9th volume, chapters 18th and 19th, whose ancientness is undoubted.

The history of Sambhar Lake can, however, be distinctly traced to a thousand years back to the Moghul times. A few hundred years before the Moghuls, however, are shrouded in mystery. A curious Hindu tradition is attached to its formation. Tradition ascribes the formation of the Sambhar Lake to the gift of Shakambari Devi, the tutelary goddess of the Chowhan Rajputs, who about 551 A. D. in return for milk supplied by one of their cows to a religious ascetic, converted a forest into a vast plain of precious metals. The then inhabitants of Sirthula, a village situated a few miles from Sambhar, looking upon it as a curse rather than a blessing as it would be sure to lead to endless feuds, requested the goddess to retract her gift. But the goddess being too magnanimous to retract her favour, converted it into a crude form and transformed the lake from silver to salt.

The inhabitants of Sirthula, however, remained ignorant of the value of the lake until the Souba of Mathura, who was passing through Sambhar *en route* to the sacred lake of Puskar, noticing the salt crystals formed by its water, communicated its worth to them; and in order that he might work the lake had himself transferred from the charge of the Mathura district to that of Ajmer. A family now residing at Sambhar claims descent from this personage and judging from this tradition the lake has been worked for salt at least during the past 1400 years.

Such is the tradition, which is fully accepted and believed alike by the Hindu and Mohammedan population of Sambhar and the surrounding villages as well as by the Banjaras, who used to crowd at the lake with their pack-bullocks to carry away the salt to northern and central parts of India. The shrine of Devi (Shakambari) stands on a rocky hill, which juts out into the lake and is amply supported, with a large number of priests, by the offerings of her votaries.

Sambhar Lake has been the scene of many fiercely contested battles between the Rajput Chiefs and their Mohammedan conquerors. The lake originally formed a portion of the territory of the Chowhans from whom after frequent contests, it was finally wrested by the Mohammedan invaders. It was not, however, till the time of Akbar that a settled system of working the lake was introduced. Akbar, to whose genius the value of the lake became apparent, improved its resources. In his days the income from the lake was about Rs. 2½ lakhs per annum. It had gradually risen to Rs. 15 lakhs, when Aurangzeb ascended the throne. The salt used to go far and wide. With the decline of the Moghul power, the revenues fell and ultimately about 1770 the two Rajput confederates appropriated the lake without a struggle.

During the next epoch, the management of the lake passed backwards and forwards between the Rajputs and the Mahrattas, Udaipur State too being mixed up in its affairs. History is silent as to what revenue was raised in those days (from 1770 to 1834) till the British assumed charge of the lake in 1835. This was through the difficulties of both Jaipur and Jodhpur resulting from the marauding of the Shekawattis, the bands of plunderers, which led the British Government to adopt vigorous measures for their suppression and stoppage of their predatory raids into British territory. A large British force was assembled at Ajmer for this purpose in 1834-35. The revenues of the Sambhar Lake were assigned to the British Government by the States till the Government repaid themselves. The lake was released from sequestration in 1844. During these ten years it yielded a revenue of Rupees seven lakhs per annum. From 1844 onwards the lake was worked by the Shamlat, the joint Government of Jaipur and Jodhpur.

Originally there were about 60 villages attached to the lake. The Mohammedan conquerors confined their attention to Sambhar. At that time Nawa and Gudha were insignificant hamlets but they gradually developed into salt marts. Most of the villages gradually fell off the lake, various States taking advantage of the weakness of their neighbours and apportioning the villages to themselves. The remaining ones were divided between the Jaipur and Jodhpur Darbars. Nawa and Gudha came to Jodhpur's share, and the lake remained the common property of both the States. When Jodhpur began to develop salt works at Nawa and Gudha, Jaipur became envious. This led to constant factions and discords between the two States; the Holkar and the Scindia too got mixed up with these. The revenues of Nawa and Gudha from 1860 onwards varied from 1½ to 2 lakhs of rupees per annum. This went on till the lake including Nawa and Gudha was taken over by the British Government in 1870 on lease from the Jaipur and Jodhpur Darbars, and was worked by it until the attainment of Independence by India in 1947. Since 1947 it is being worked by the Central Government.

(b) *Objects of the lease.*—The British Government obtained the lease of Sambhar Lake from Jaipur and Jodhpur Darbars in 1870. To understand the object behind this it is necessary to be familiar with the background and to know the system of salt revenue prevalent in those days.

The essence of the salt revenue administration system prevailing from 1820 to 1870 was the levy of duty on salt imported into British territory and the suppression of manufacture of salt within that territory. The great Inland Customs Line existed for this purpose. The main object of the Line was to prevent salt, the produce of the old Indian States, entering British territory unless it had paid a duty of Rs. 3 per maund. A subsidiary object

was to tax all sugar exported across the Line at the rate of one rupee per maund for refined and 6 annas per maund for unrefined saccharine produce. A large amount of revenue nearly Rs. 1,50,000 was collected.

The great Customs Line was 2,500 miles long and stretched from Torbela on the Indus to Mahanadi in the then Sambalpur district of the old Central Provinces (now in Orissa) and was guarded by an army of 13,000 officers and men at an annual cost of Rs. 16-17 lakhs. This line consisted of a huge barrier of an impenetrable hedge of bushes and undergrowth reinforced by stones and boulders and in some places even by masonry works. The Commissioner, Inland Customs Department, in his Administration Report for 1869-70 said, "The Line divided into 100 beats, each presided over by a Patrol or an Assistant Patrol, is watched from 1,727 guard-posts by some 10,000 men and non-commissioned officers. A very perfect system of patrolling exists and except in some very wild portions of the Central Provinces (where tigers bar the way alike to smuggler and Customs Officers after dark) goes on with unabated vigilance night and day".

This system of taxation was unsound, cumbersome and a serious handicap to trade. Unless this large amount of revenue was to be given up it was necessary either to maintain the Customs Line or resort to some other plan for securing the duty on salt. The plan was to exercise or control the production of salt, and the production lay almost entirely in Indian States. To carry out this, therefore, it was decided to take the main salt sources on lease. The essence of the scheme was to obtain for the British Government from the salt producing Indian States of Rajputana and Central India on the basis of compensation, the right of taxing the salt of Rajputana and Central India at the place of production and of strictly regulating its manufacture. The primary object of the scheme was to secure the British Government against loss of revenue in the event of the abolition of the Customs Line. The secondary object was to secure the abolition of all duties on traffic levied by the old Indian States.

Between the years 1869 and 1881 protracted negotiations relating to salt were carried on with several of the Indian States of Rajputana and Central India. The ultimate object at which they aimed was the equalisation of the salt duties throughout India to such an extent as would admit of abolition of the Inland Customs Line. Another important object was to increase the supply of cheap salt for Northern and Central India. The first two steps necessary for the attainment of these objects were the acquisition by the Government of control over the extensive salt sources at the Sambhar Lake and the opening of railway communication between Rajputana, Delhi and Agra. Railway communication was extended to Sambhar and the assumption of the lake by the British had a most favourable effect on the price of salt in the British territory. In the beginning the selling price was 10 annas a maund, but it gradually fell to three or four annas a maund during the next 20 years. The arrangement was thus a source of profit to the old Indian States, the British Government and the people. Government got the lease for an annual payment of Rs. 7,00,000 on the condition that if the sales of salt exceeded 17,25,000 maunds in any year, forty per cent. of the sale proceeds of such excess would be paid to the States as Royalty. (The Treaties made between the Government of India and the various Indian States have been given in the Appendices.)

The compensation actually took the following forms:—

- (a) an annual assignment in cash;
- (b) supply of free salt;

- (c) supply of salt at concessional rates;
- (d) share in profits, if any, and
- (e) royalty on production in excess of a certain figure.

After the abolition of duty on salt from 1-4-1947 the position has changed. The Indian States were allowed to manufacture salt without any restriction in order to meet the shortage in production in the country after partition. There was also integration of the States and it was decided that all salt compensations to States which merged with the Indian Provinces should stop from the date of the merger of the State. Therefore in some States like Baroda, Sirohi and the Deccan States, the payment was stopped from the date of their merger with the provinces.

But in the case of the States which merged to form Unions, especially in the case of the Rajasthan Union, it was decided by the Ministry of States that salt compensation agreements with them would continue in force up to 31st March, 1950 and that the liabilities of the Government of India shall terminate with effect from the date of the Federal Financial Integration with the exception of payments which are of a commercial nature, such as rent whether payable in cash or kind or royalties. After a conference with the representatives of the Rajasthan Union, a schedule of payments was drawn up by the Government of India which has been incorporated in the agreement which has been entered into between the President of India and the Rajpramukh of the Union.

The average royalty paid to the old Jodhpur and Jaipur States during the five years preceding 1-4-1947, the date from which the Excise duty on salt was abolished, amounted to Rs. 9,01,918, and since that date the average annual payment has been Rs. 9,68,000. Payments are now made to the Rajasthan Government.

6// (c) *Situation.*—Sambhar Lake is the largest single salt source in India. It is situated in latitude 26°58' N and longitude 75°5' E on the east of the Aravalli hills in Rajasthan. The bed of the lake varies from 1181 feet to 1196.76 feet above the sea level. The surrounding country is arid and sterile and to the north west is the Great Desert, with Sind (in Pakistan) on its western boundary. It is situated at a distance of about 60 miles from Ajmer and 40 miles from Jaipur and is connected with the Grand Trunk road by a passable motorable road from Dudu, which is 18 miles from Sambhar Lake. The western half of the lake lies within the limits of the former Jodhpur State while the eastern half was owned by both Jaipur and Jodhpur jointly. The ownership of the lake passed on to the Rajasthan Government in 1950 on the integration of the Indian States after independence. Except during the rains, or immediately thereafter, the first view of the so-called Sambhar Lake cannot fail, in most instances, to disappoint the visitor; for an examination of the map of the country as also its name leads one to the expectation of a large expanse of water reaching the horizon. But, on the contrary, as we come at any other season to stand on the low sand ridges which abound the southern border, we see stretched before us as it were a vast sheet of snow. On the north-west hills are visible bounding the vision on that side, whilst opposite to the north, at distances of 6 and 9 miles, the white houses of Gudha and Nawa on the margin of the plain glitter in the sunlight. Turning eastwards the town of Sambhar, crowning a low eminence, marks the eastern limits of the Lake. To the west, rounding the bold promontory of the Mata Pahar, the lake extends about 12 miles. The lake is about 22 miles long and about 6 miles broad,

with an average depth of 2 feet. In the height of the rains it covers an area of nearly 90 square miles. The circumference of the lake is about 60 miles. It is fed by four rivers, which drain an area of over 2,200 square miles.

(d) *Geological*.—The Sambhar Lake, if we call by this name that sheet of water which annually fills up the huge shallow depression, owes its origin solely to the annual rainfall. It is not a permanent lake, but a lake which is dry during a greater part of the year and which is filled with water only during the monsoon. It ranges, therefore, amongst the class of lakes which have been called intermittent lakes. The periods of dryness and fullness are apparently very irregular and the intervals between the two may be so short that one period of fullness merges almost into the other. Sometimes the periods of dryness or fullness, as the case may be, are extraordinarily prolonged.

On the other hand, if we examine the depression in which the lake is formed, we find that it represents a basin filled up by alluvial silt, and surrounded on all sides by a higher terrace consisting of sand. The problem of the origin of the salt shapes itself therefore in the following way: How does the salt come into this basin; does it come from an outside source or is it contained in the basin itself?

Observations have proved that all along the southern, western and north-western parts of the lake the Aravallis rise above the surface. The basin is, therefore, entirely closed from this side, and in order to show that it was entirely closed, we have also to prove the existence of the Aravallis on the northern shore between Sambhar and Gudha. Unfortunately no outcrops of the Aravallis could be observed here, because the sand of the high terrace is too thick. The only part of the lake where the existence of the Aravallis as forming the borders of the basin could not be proved so far, is, therefore, the comparatively small distance between Sambhar and Gudha. Although the Aravallis have not yet been found, the brine cannot possibly enter the basin from this side.

The above observations tend to prove that the basin of the Sambhar Lake is formed in the Aravallis, and that we have to imagine it as a longitudinal valley stretching approximately in a north-west south-easterly direction. The bottom of this basin or valley is very likely uneven, and its greatest depth from the surface may perhaps be somewhere in the central part near Mata Pahar.

This basin, surrounded on all sides by the Aravallis which also form its bottom, is filled up with horizontally bedded silt. When wet this silt is of a dark bluish colour; when dry it exhibits a greyish tinge. The silt is deposited in beds of varying thickness; some of the beds are rather hard and apparently calcareous, but most of them are argillaceous and contain a considerable amount of mica. It is unquestionable that this silt is derived from the surrounding country from which it has been washed into the basin, gradually filling it up. The silt attains a considerable thickness in the central parts of the lake. The geological features of the surroundings of the Sambhar Lake are, therefore, very simple. We have—

- (i) the Aravalli series forming the bottom of the basin and surrounding it on all sides,
- (ii) the lake silt of alluvial origin, filling up the basin, and
- (iii) the high terraces and and clay resting on the Aravalli series outside the lake basin and surrounding it on all sides.

There is absolutely no trace of either mesozoic or tertiary strata, and if present at all, they can only exist in the lake basin concealed by the alluvial silt.

The lake bed consists of a rocky basin stretching over the whole area of about 60 square miles of the lake and covered with silt which is 65 feet deep in the centre and 10 to 15 feet at the shores. The salt resources of the lake are hidden in this saliferous silt as seen from the following analysis of average samples of the lake mud at the surface and at different depths:—

On Air Dry Basis

	At surface	At 1 ft. depth	At 2½ ft. depth	At 4* ft. depth	At 6* ft. depth	At 12* ft. depth.
Sodium chloride .	16.02	4.97	5.66	6.45	6.78	6.50
Sodium sulphate .	5.15	1.22	1.49	..	..	..
Sodium carbonate .	0.66	0.53	0.27	..	..	..
Sodium bi-carbonate .	0.11	0.21	0.42	..	..	..
Insolubles . . .	74.46	89.18	87.21	..	..	..
Moisture	3.60	3.89	3.95	..	..	..
Total	100.00	100.00	100.00	..	..	..

* Full analysis not available.

The subsoil waters in the lake bed, therefore, carry the salts in solution and whenever a pit or a well is dug strong brine is reached within a few feet from the surface. Various theories have been advanced to explain the origin of this salt.

The first attempt to explain the origin of the Rajasthan Salt Sources seems to have been made by Mr. A. C. Hume, Commissioner, Inland Customs, in his annual Administration Report for the year 1867-68. He refers to the salt in the Sambhar Lake as possibly a mere surface deposit due to drying up of an inland sea or possibly, according to some, "the washings of countless ages out of the surrounding Permian formation". Mr. R. M. Adam, Assistant Commissioner, at Sambhar, mentioned about the possibility of brine springs in the bed of the lake in 1870, but favoured the theory that the salt came from the Permian rocks around. Later many Geologists have advanced various theories to explain the origin of salt. These can be divided into two categories:—

(1) *Those which assume that the salt is contained in the lake deposits itself and is not brought into it from outside sources.*—One theory assumes that the sea originally reached inland as far as Sambhar, and that on its retreat it left behind a salt-impregnated substratum, and another theory assumes that there exist underneath the silt tertiary beds containing layers of rock salt.

(2) *Those which account for the salt being brought into the lake from outside sources.*—One theory assumes that the rivers which discharge their water into the lake carry also a certain amount of saline matter, which on

evaporation of the water remains behind. The second theory assumes that the primary brine rises along a fault inside the lake basin which is hidden by the silt. The third theory assumes that salt has been blown by winds from the Rann of Kutch. The whole features of the salt are against its being of marine origin, and if anything it bears the marked characters of fresh water deposits. Granting even that the silt were of marine origin, it would not retain its salt for any length of time, because the percolating water would soon dilute and remove the salt.

(ii) *Rock salt bed.*—It is said that underneath the silt and hidden by it, resting upon the Aravallis, there is a layer of solid rock salt. This rock salt is dissolved by subterranean water which rising forms a layer of brine permeating the silt resting on the rock salt.

Some of the other theories advanced to account for the origin of the salt in the Sambhar Lake are detailed below:—

1. Some believe the foundation of the bed of rock salt.
2. The second theory is that the lake contains brine springs similar to those which exist in the Bharatpur State. Dr. Noetling of the Geological Survey of India, who was deputed to report on the resources of the lake in 1902 suggested that the salt of the Sambhar Lake is obtained from a subterranean saline spring arising along a fault-plane hidden by the mass of silt which now forms the bed of the lake. No proof exists as to the presence of a fault-plane, and no attempt was made to account for the occurrence of salt in a spring arising through the Aravalli schists. The idea of the existence of a saline spring arising through the schists is not supported by any direct and positive evidence. To test Dr. Noetling's theory, three borings were sunk one at the centre of the lake (Khazana), one outside Kyar No. V and one inside the Kyar at Nawa. These borings were carried to depths of 61, 72 and 76 feet respectively till they touched the underlying Aravalli schists. The boring showed that there is a layer of salt mud, sand and *Kunkur* 70' thick resting on the Aravalli schists. Thus Dr. Noetling's hypothesis cannot stand.
3. According to the third theory the lake is believed to derive its salinity from the denudation of the rocks of the surrounding country which is supposed to belong to the Permian system, a system which abounds in lime stone or salt. The Sambhar Lake is annually replenished by rain and the drainage of the surrounding country. The lands from which this drainage flows are more or less impregnated with salt given off in a sort of efflorescence which is swept into the lake by the rivers. But this cannot explain the tremendous amount of salt taken out for centuries. The wells around the lake contain sweet and fresh water. So some geologists suppose that the origin of salt cannot lie on the surface of the soil, but in some central sphere below the low water mark of the lake in the shape of a foundation of rock salt or in brine springs. Some suppose that a stratum of salt brine of high density underlies the bed of the lake at a depth of about 30' and is under great pressure. Generally the major portion of the brine in the lake is pumped out into reservoirs and crystallisers and the remnant evaporates leaving the bed exposed to solar heat in a dry atmosphere. But though this happens, the mud of the lake bed remains soft and wet. This is probably owing to the evaporation of subterranean brine and salt in that brine in such cases drains upwards by capillary attraction and remains in the soft mud on the surface of the lake bed. When the lake again fills, the water which collects in it is agitated by the prevailing strong winds, most of the salt in the surface mud is taken up in solution and the visible

supply of salt is thus renewed. Experience shows that the brine is richer in salt in years during which high winds blow than those during which the atmosphere is calm.

4. According to Sir Thomas Holland the salt resources of Sambhar appear to be limited to the body of silt filling in the depression in the Aravalli schists where the sodium chloride along with large quantities of sodium sulphate and sodium carbonate has accumulated in a way common to arid regions of internal drainage. He also believed that the supply of subterranean brine is dependent on the access of water from the sweet water zone all around the lake. Inward percolation of water from the margin is essential to the formation of large quantities of subterranean brine. He remarks: "The Sambhar Lake is a silt filled depression in the Aravalli schists and gneisses in which a body of mud and sand with *kunkar* and gypsum (some 75 feet thick in what appears to be about the centre of the depression) includes from 2 to 12 per cent of sodium chloride with smaller quantities of sodium sulphate, sodium carbonate and potassium sulphate. Every year the water brought in by the rivers, which are in flood during the monsoon, forms a lake some 60 square miles in area and 2 to 3 feet deep. The water which is fresh when it first comes in, takes up salt from the accumulated stocks in the silt and forms a strong brine which is partly led into prepared enclosures (*kyars*) for the separation of salt by solar evaporation, partly isolated by temporary reservoirs constructed and cut off bodies of the lake water in anticipation of the recession towards the centre during evaporation and partly forms a thin crust of white glittering salt on the bed of the lake where it is allowed to remain until the arrival of the next monsoon and the usual annual flooding of the lake.

✓ 5. Dr. Christie's theory—Salt as wind borne. It was suggested by Dr. Christie that most of the salt is brought in the form of fine dust by the strong south-west winds that blow across the salt in-crustated region of the Rann of Kutch and from the sea coast during the hot months and is dropped in the interior of Rajasthan when the velocity of winds passing over it has decreased. He thought that salt carried by the south-west wind into Rajputana would account for most of that which is found impregnated in the soil throughout the desert region. By the floods formed during each monsoon this salt would be washed and will give rise to the numerous salt lakes.

The lake bed is composed of $1\frac{1}{2}$ ' of black *fetid* mud. Below the mud is a layer of quicksand overlying a stratum of micaceous schist composed on the top, but harder below. No rocks are found to a depth of 20 feet. Borings were made in 1904-05, they touched the underlying Aravalli schists at a depth of about 70 feet. Salt pervades in minute crystals the whole substance of the black mud which contains an immense quantity of it. According to Sir Thomas Holland and Dr. Christie there are fifty-five million tons of salt in the first 12 feet of this saliferous salt alone. The large harvests removed annually under the British management of the lake have caused no appreciable diminution in the stock which according to Sir Thomas Holland may be considered sufficient to meet all demands for a practically unlimited period. Stretching over the whole area and to a depth of 60—70 feet lies the body of this silt in which the salt resources of Sambhar are hidden.

(e).—System of Manufacture (1) Pre-British.—Salt was made or obtained in three different ways at the lake. The most adopted method was called the 'Pai' or 'Sangar' which consisted in throwing up low retaining walls to prevent

the water from receding to lower levels. The object gained by the construction of these walls was that during the hot months they exposed a certain portion of the brine to rapid solar evaporation, and prevented it in its concentrated state from flowing down to the lower levels of the lake, which it would otherwise do. To expedite rapid evaporation, lower walls of mud only were made at right angles to the main wall, thus separating the enclosed sheet of water into a multitude of salt pans. When a crop of salt had been stored, sluices were opened in the main retaining wall to allow the strong monsoon winds from the west to drive the lake brine into the pans.

First Method.—The construction of the retaining wall was simple, and was effected by labourers fixing two rows of wooden piles or pegs about eighteen inches apart firmly into the soft mud. A lining of grass was arranged on the inward faces of the pegs, and mud was dug up from the outer sides and filled into the intervening space. The height of these walls was regulated by the density of the brine, and varied from one and a half to three feet. In 1864, when the lake was unusually high, and the brine consequently weak, walls three feet high had to be formed to retain two feet of water. There were hundreds of these rectangular enclosures, varying in area from 1 to 10 acres, but salt was not made in all of them. When the lake was very high, the outermost formed salt, and the innermost never dried up at all. When the lake, on the other hand, was low, as sometimes for several successive years it remained, the outermost had either never been flooded in the rains or had too little, to make the salt, that could be formed in them worth collecting, and then it was from the innermost ones that the harvest was obtained. Towards the close of the rains, it was decided where salt could be advantageously formed, and there the ridges were repaired and renewed; the extent of the work thus done being dependent on the stocks in hand, and the expected demand. There used to be from 18 to 30 inches water over a plot at the close of the rains, of which from 6 to 12 inches was left when towards the end of March the hot weather began. Of course, the yield of salt so procured, (and it was thus that, on an average of several years, most of the salt was obtained) varied very much. The poorest yield was about 300 maunds, and the richest about 1,200 maunds to the acre.

Second Method.—There were four large permanent pans two at Sambhar, one at Gudha and one at Nawa, which more resembled coffer dams than anything else. Considerable spaces of the lake bed from 500 to 800 feet long and from 200' to 400' wide, were enclosed by a double row of rough stout piles, projecting from 5 to 8 feet above the soil. The rows were 3-4 feet apart, and the inter-space was filled in with straw, branches, and well-rammed clay, so that each enclosure was water tight. A single sluice gate was kept, by which water could be run in from the lake. When the lake was high, these enclosures were surrounded by 3 to 4 feet of water, and it was when the water elsewhere was too high for the adoption of other modes of manufacture, that these dams were chiefly used. From 1 to 2 feet of water were admitted into them, the sluice closed and the enclosed water allowed to evaporate, depositing all over the bottom a thick crust of salt formed of $1/2$ to $2/3$ inches cubical crystals. This crust was removed and more water let in and so on, as long at least as the water of the lake remained high. In some years only one crop was obtained in the Sambhar dams, but in others when the level of the lake kept high for several months many successive crops were obtained. The Nawa and Gudha dams were better situated in some respects than those at Sambhar. One of the Sambhar enclosures which enclosed about 3 acres, yielded about 3,600 Bengal mds. The return was thus about 1,200 mds. per acre.

Third Method.—At certain places, particularly at Ratan-Ka-Talao, on the southern shore near the Mata Pahar, and between Nawa and Gudha, on the northern, and nearly opposite the Mata, the lake water did not dry up until all the shallows had dried up and little remained. In the central portion of 'Khazana' of the lake, specially in dry hot years, as the water evaporated, a thick unbroken snow white crust of salt was formed; so hard when dry as to bear a horses' hoof, and needed pickaxes or *phaorahs* to break it up. The quantity of salt, thus produced in some years was incredible; a tenth portion of it was never gathered. This crust appeared over a long expanse in the lake for acres together. The contents of one acre came to at least 2,000 maunds. Thus a very large quantity could be collected from the crust. As a rule salt was all extracted before the water had quite dried off it.

Generally the retaining wall method was adopted. The enclosure method was resorted to when the lake water was too high to permit of the first or retaining wall method being adopted. Only three embanked enclosures existed in 1870. In 1861, six such enclosures were in existence, but the excessive rains of 1862 swept them all away. They were re-built in 1863, and measured 350 yards \times 80 yards. When the British took over in 1870 the retaining wall constructed jointly by the Governments of Jaipur and Jodhpur measured 7750 yards in length and the salt field enclosed an area of 411.525 acres.

2. *During British Times.*—(i) 1870-1900—The lease of the lake was taken by the British Government in 1870. In the beginning the old methods of manufacture were followed but gradually improvements were effected. For instance, in the very first year, a low retaining wall for the retention of the lake brine was constructed—total length being 14,558 yards or 8.27 miles. Of this 9,728 yards were securely made with grass and stakes, but in some portion of the lake where the erosive action of the water was inconsiderable and on a portion of the lake towards Jhapog, where brine became sufficiently low and was so highly concentrated as to preclude the possibility of the wind blowing it about in any volume, 4,830 yards were made of stiff mud firmly beaten together. The following systems of manufacture were followed:—

Lake Salt (spontaneous).—This salt formed spontaneously in the bed of the lake as the brine evaporated without any assistance, except that light screens or retaining walls called 'pais' were run out to retain the brine in selected areas most favourable for condensation and extraction of the salt. If this were not done, the brine would recede to the centre of the lake and the salt would be deposited at such a distance from the shore that storage would become difficult and expensive. When the British Government took over in 1870, the retaining walls were 7,700 yards long and the area worked was 411 acres. When the brine of the lake reached a high specific gravity and began to recede towards the centre, it was enclosed within sections of the lake bed by means of rough retaining walls $1\frac{1}{2}$ feet to 2 feet in height, built of double lines of stake lined with grass. The space between the stakes was filled with lake mud. These enclosed sections were generally situated near the shore, since salt formed in them had to be carried to the shore by the labourers and a long distance from the storage site would make the carriage too expensive. The brine was maintained at 25° Be and about 12" deep. Fresh supplies of brine too were admitted. When ready, the salt crust 2" to 3" was taken out and heaped up by labourers in the enclosures and basket-fulls of salt were brought out and stored in large heaps on the lake edge. This spontaneous salt was

of average quality. From 1870 to 1890 a fair amount (on an average about a million maunds) was produced under this system. In a favourable year the area under this system was 5 or 6 square miles. When the level of the lake was low owing to a low rainfall, the quantities of brine enclosed in the lake bed enclosures were small and yielded a small produce of salt. In 1894-95 about 6½ lakh maunds were produced under this system. This method finally, disappeared in 1899. During 1897-98 only 47,000 maunds were produced under this system.

After the close of the rainy season, shallow evaporation pans each about 100 feet long and 50 feet broad were made along the line of the lake shore by scraping aside the soft surface mud and with it enclosing rectangles with ridges of about a foot in height. The pans were fed from large trenches cut down towards the deepest part of the lake and also from brine retained in deep reservoirs which were filled when the lake was full. The brine from trenches and reservoirs was raised by 'jhapoolas', baskets lined with sheep skin each worked by two men. In a year of good rainfall brine was mostly utilised from the lake, but in a year of drought the pans were mostly fed from wells. The brine in the pans was kept at a depth of three or four inches. Crops were obtained in rapid succession, each crop being ready within a period ranging from 2 to 4 weeks according to weather. When salt precipitated, it was scraped up by means of small pieces of planks attached to long handles. It was first placed in conical heaps near the pans and finally carried to storage ground and stored there in big heaps. There were 619 pans in 1875-76, but in 1879-80, the number rose to 2508. Gradually the number rose still further. A very large quantity often 30 or 40 lakh maunds was manufactured under this system, about 4,000 to 5,000 of these pans occupying a length of 15—20 miles along the lake shore being worked. As the water of the lake receded, the pans first worked had to be abandoned and fresh ones prepared further in. About 1880 the number of pans worked was 2,000, during 1882 it was 4,934. During 1894-95 pans produced over 22 lakh maunds of salt, but during 1895-96 the output fell to about 9 lakhs owing to scanty rainfall and difficulty of procuring brine of proper solution and of sufficient quantity available along the shallow shores of the lake.

Kul brine too was tried for the manufacture of pan salt. In 1880-81, the manufacture of pan salt from Kul brine was again tried under Mr. Halsey, the then Commissioner's orders, and some good saleable salt was made. The manufacture was continued in 1882-83 and 1883-84, the quantity of pan salt made from Kul or subterranean brine in 1882-83 amounting to 773,078 Mds. In 1883-84 it was, however, decided to make no more pan salt from Kul brine in the Sambhar section and at Gudha, as the salt made was considered to be inferior. At Nawa the Kul brine continued to be used.

In 1890-91, after a partial failure of the monsoon, Kuls were once more dug to increase the yield of pan salt, but the result was held to be unsatisfactory, and the works were soon closed. In 1898-99, the rainfall was deficient, and as it had been short in the 3 preceding years and the total quantity of salt made in 1897-98 amounted to 18,31,629 Mds. only, Mr. Lyon, notwithstanding his strong prejudice against subterranean brine, was constrained to resume pan salt manufacture from Kul brine at Nawa and Gudha. Pan salt was then made from Kul brine in large and increasing quantities. No record has been maintained of the quantities of pan salt made from Kul brine, lake brine and Kul and lake brine mixed, but as the

lake dried rapidly after the cessation of the monsoon nearly all the pan salt made during 1896-1906 amounting to about 96,00,000 maunds was made from pure Kul brine diluted by occasional showers.

Kyar Salt.—A kyar is a salt work constructed in the bed of the lake by enclosing a rectangular space with an embankment of lake mud 5 to 6 feet in height, pitched with stone to protect it from the main body of lake water. Within the enclosure large solar evaporation pans are excavated and brine is run into these pans from the lake by gravitation or by pumping. When the salt crust is ready, it is broken up and is extracted after being washed in bitterns and stored in oblong heaps. In 1880 out of a total output of 60 lakhs, 25 lakhs was pan salt, 11 lakhs spontaneous lake bed salt and 24 lakhs was kyar salt. 1884-85 to 1888-89 were years of good rainfall. The kyars continued to be in high favour when mostly kyar salt was manufactured. In 1886, out of a total of 67 lakhs, 34 lakhs was pan salt, 21 lakhs spontaneous lake bed salt and 11 lakhs kyar salt. In 1894-95 out of a total of 70 lakhs, 22 lakhs was pan salt, 6 lakhs lake bed and 42 lakhs kyar salt. This shows that the kyar method gradually ousted the other two systems.

In 1898 there were 10 kyars at Sambhar and one at Nawa. The size of these rectangles varied from 1681' \times 951' to 4150' \times 1446'. The smallest enclosure had 20 solar evaporation pans each 420' \times 152' and an evaporating surface of 23½ acres, the largest had 60 pans each 670' \times 200', and an evaporating surface of 184½ acres. The total evaporating surface was about 736 acres. They were the great stand-by alike in seasons of deficient rainfall as in seasons of excessive rainfall and produced about 35 lakh maunds of salt. Another large Kyar was constructed at Nawa on the western shore of the lake about this time, at a cost of Rs. 1,44,700 plus Rs. 42,052 for its two Railway sidings.

1900 to 1920.—After 1900 most of the product was kyar salt. For getting subterranean brine a canal was constructed at Sambhar in 1906. This proved a valuable asset in manufacture. Pumping machinery too was introduced, and reservoirs constructed but the output could not be guaranteed. During these years the same methods continued to be followed but gradually the Kyar method ousted the other two systems, viz. pan and spontaneous salt as it was found that kyar salt was cheaper to manufacture. The paucity of rainfall in several years also showed the value of walled enclosures or kyars. The enclosures or kyars were so constructed that the supply of brine to them could be regulated to suit the season and the requirements of manufacture. The advantage of the kyars was that the manufacture in them could be carried on uninterruptedly at times when extraction by other processes would be impossible owing to there being either too much or too little brine in the lake. But for their existence manufacture would have practically failed in several years as for instance in 1896-97. So the policy of constructing kyars continued to be followed. The system gradually gained ground and ousted the pan system. Pan salt manufacture after 1900 was mostly confined to Nawa and Gudha. Very little was manufactured at Sambhar. No pan salt was manufactured at Sambhar and Gudha after 1911-12 and at Nawa after 1919 until its revival during the last war.

During the cold weather of 1917, the then Commissioner, Mr. Fergusson, who was placed on special duty, made an enquiry into the methods and disabilities of the source, visiting the salt works of Madras and Bombay for the purpose of comparison, and in 1918 he submitted a report. He dealt with the problem in detail and in the end requested the Government

of India, in consultation with the Inspector General of Irrigation, to depute a suitable expert to examine the position and advise on the action to be taken. In particular he suggested that early action was required—

- (1) to provide a sufficient number of deep reservoirs soundly designed to minimise evaporation and to conserve in normal years all the low-density brine required for a full manufacturing season;
- (2) to examine the possibility and utility of a combined scheme of reservoirs and condensers on the general lines followed in Madras and to prepare such a scheme, if it should be found feasible;
- (3) to construct on correct lines more canals for the collection of subterranean brine;
- (4) to review the unsatisfactory pumping arrangements and in view of the inadequacy and expense of the miscellaneous steam and oil plant of all kinds in use to consider the advisability of introducing electric power;
- (5) in view of the defects in the siting of certain of the works to decide on the best lay-out for any new works that might be constructed in future;
- (6) and (7) to extend on sound lines the Nawa works at the north end of the lake after solving the problem of holding up brine to supply them;
- (8) to experiment with the hardening of pan floors with the object of obtaining better salt, of permitting levelling and proper flushing, of saving the large percentage of output trodden by the labourers into the soft slush of the beds and of facilitating the adoption of the 'accretion' system of manufacture;
- (9) to experiment thoroughly with the accretion system; and
- (10) to provide a water supply, to be piped to the various works for the engines and the workers alike.

The services of Mr. S. A. Bunting, an Executive Engineer of the Irrigation Branch of the United Provinces Public Works Department were secured. He made his preliminary investigations in September 1919. His projects received the sanction of the Government of India and were completed in March 1924, when his deputation came to an end. The total cost of his undertakings amounted to over 30 lakhs of rupees.

The object of the scheme was the stabilisation of this important source of salt supply by conserving low density brine, constructing new kyars, condensers and canals, overhauling the old pumping arrangements and putting the systems of manufacture on a sound footing. One of the important features of the scheme was improvement of the arrangements for transport, storage and issues.

The main features of the Development scheme are outlined below :

(i) *Reservoir, Gudha-Jhapog Dam.*—The work of the Development Scheme commenced in May, 1920. The eight square mile reservoir was made by constructing a dam across the lake from north-west corner of Jhapog kyar to the south-west corner of Gudha kyar. This dam is 2½ miles long and took over a year to construct. The clay silt of the lake bed

thoroughly lubricated with brine proved an impossible material to construct the dam with, except close in shore on both sides, and sand had to be brought by train from 'quarries' in the hills near Gudha and Jhapog. Moreover the quantity was far from being merely that required to construct a plain embankment 10 feet high. As fast as sand was dumped it sunk, squeezing out the clay and billowing it up for a considerable distance on both sides; indeed the floors of borrow pits in the lake bed even more than 100 feet from the dam burst upwards under the pressure. Nor, was this sinkage gradual, often a section of dam several hundred feet long would suddenly sink, and the railway track and train with it, the worst case involving a sinkage of five feet and a lateral movement of fifteen feet. Yet there was really no serious cause for anxiety on this score, the sand spread and each fresh sinkage meant that the pressure was being further distributed and the unit pressure reduced; it was bound to float finally. At some points sand has sunk 20 feet below the lake bed. Actually water-tight portion of the work consisted of the billows of clay taken out from the centre of the flinx. These billows have finally settled down at a heap of about 8' to 14' in height and 32 feet in width. The dam is pitched with stone both sides the whole length of $2\frac{1}{2}$ miles, and it was finished just before the rains of 1921. Meanwhile the pumping station at the Jhapog end had been built. The reservoir is 2 miles across and the water surface was once measured as one and a quarter feet higher on the east side than on the west. Moreover, the evaporation during September 1921 was in the neighbourhood of 1 inch per day. The area of 8 square miles had to be reduced, and an area of about one square mile cut off from it. This was done by constructing an embankment 4 miles long roughly parallel to the south shore of the lake. A large portion of the one square mile area cut off was on sloping sandy ground and of very doubtful advantage as a reservoir area. It would have been shut off by a second embankment $2\frac{1}{2}$ miles long in 1921 if time had permitted. In 1922 this was done to a certain height and in 1923 this was raised and strengthened; a canal 200' wide from Jhapog to Sambhar was thus constructed.

(ii) *Pumping Plant.*—The pumping conditions at Sambhar are peculiar. Large quantities of brine, of density ranging from 1 to 1.2, and of viscosity varying in much the same ratio, have to be raised at a maximum, 5 feet. The pumps must, however, deal, with efficiency, with all heads between 0 and 5 feet. In these conditions the standard cast-iron, horizontal centrifugal pumps, previously installed at Sambhar in all sizes up to 14 inches, were very inefficient. Apart from the fact that, to suit standard pipe connections, the pumps were given a free outfall and worked against heads twice those required, corrosion, and crystallization of salt in the strainers, foot valves and impellers gave ceaseless trouble. After considering various alternative for the right type of plant, it was decided to get Sulzer pumps. The Jhapog pump impellers and guide vanes and gearing were made by sulzers, but they left the Department to make suction entrances and volutes in concrete. They only supplied the impellers, guide-vane rings, cast-iron covers to carry the lower guide-bearings, shafts, (cast-iron casings enclosing the upper guide and thrust-bearings, and bevel gears). The next development was the departmental construction of six 'Montpellier wheels' (so called after the city of their origin). Pumps were designed for 140 cft. of water per second some 3', but in practice they often have had to pump against a 6' height.

Experience in 1921 also showed that the wind might change and blow the brine away from the Jhapog pumping station at a critical moment, but that as a rule it would then head up water towards the Gudha end

of the dam. This showed that a pumping station as large as the first, near the Gudha end was necessary, combined with a wider and deeper regulator for inlet by gravity or rather wind flow.

This pumping station and regulator was built in 1922-23 and allowance was made in constructing it for the subsequent addition of windmill towers to pump by wind power. The pumps for this were home made or rather home-designed and they effected very considerable economies in prime cost as compared with the Jhapog station.

(iii) *Percolation canals.*—Two percolation canals, the East Lake and Nawa canals; were in operation prior to the development schemes. A third was made at Gudha in 1922. To get the best out of these they must be taken down as far as possible to the underlying schist rock where it is near enough to the surface. It has not been possible to achieve this object as the cost is prohibitive. Even a large portion of our Sambhar canal is silted up.

It was hoped to get at the sub-soil brine more cheaply by sinking tube wells and by putting on a considerable 'depression head' to make them yield a supply commensurable with that obtained from canals. At No. 9 Kyar a 15" boring was sunk 85' from the surface but only impermeable micaceous schist was met with. At No. 1 Kyar some thirty or forty feet of sand and *kunkur* were encountered under the surface eighteen feet layer of black clay, but below that again micaceous schist was found down to 100 feet below the surface. At Jhapog, under the eighteen feet of black clay, the schist was met with.

(iv) *Power House.*—The pumping arrangements prior to the development schemes were thoroughly unsatisfactory. Firstly, the pumping stations, whether steam or oil, were located far from the shore, water, oil and coal transport to them was expensive and efficient supervision impossible. Bitterns used to be dropped 17 feet into the percolation canal and pumped up 18 feet from it to be discharged. Nearly all the pumps had to serve two or three purposes, namely pumping in brine, 'doubling' i.e. pumping brine from one pan to another, and pumping out bitterns.

It was decided then that electric drive was a necessity to eliminate the fresh water, fuel and supervision trouble; that waste of 'head' must be stopped and the locations and suceway arrangements of pumping stations should be altered; and that some type of pump should be adopted that would lift water efficiently from 0 to 5 feet; that would be easy to clean from mud and salt deposits, and that should always be 'drowned' and not require filling before starting. The transfer of all these old pumping duties to the electric system together with the new service of transferring the outer lake to the west lake reservoir by means of the four 40 HP pumps at Jhapog and Gudha involved the construction of a considerable electric system, about 14 miles of three phase high tension mains carried on ferroconcrete poles and nearly ten miles of low tension mains excluding Sambhar city and Phulera. The salt settlements at Sambhar, Gudha and Jhapog were equipped with lights and fans. Supply was also given for the then Bombay Baroda and Central India Railway at Phulera junction. Fresh water is also being pumped at Sambhar. The Power House is 110' long 36' wide and 37' high, the roof consisting of two thicknesses of slate slabs separated by a four inch air space carried by ferroconcrete rafters on ferroconcrete arches with tie rods.

Two 100 K. W. semi-Diesel generating sets, the first Vickers Petter-Metropolitan Vickers and the second Vickers Petter-General Electric Company have been installed, and a third 40 K. W. Vickers Petter-Metropolitan Vickers set to deal more efficiently with light loads. The system is three phase, 3300 volts pressure and 50 cycles periodicity. A ferroconcrete water cooling tower adjoins the Power House. A part of the Power House is occupied by the workshop, now fitted with two lathes, radial drill, a shaping machine, a shearing machine, a screwing machine, an emery wheel, a grindstone and a circular saw, metre-gauge and 2 foot-gauge siding run into it and the 5 ton travelling crane serves the whole Power House. (Semi-Diesels since replaced by Diesel sets.)

(v) *New Kyar.*—The Sambhar Lake kyar system was developed on the sites of old pan works all round the fringes of the lake, as near the shore as black clay could be found. It errs seriously in not having been conceived as one concentrated unit; transport of brine to and from these scattered areas and collection and storage of salt is a much bigger problem than it need have been had the kyar area been all together in one place as it is, for instance, in the Port Said Salt Association's works. From the point of view of transport and storage of salt the Main Line kyars are easily the worst, the black clay there is the softest, the distance to the storage platforms the greatest, and the distance of their sidings from the nearest railway station also the greatest.

The desiderata for a new kyar site were, therefore, the following:—

- (1) That its area should be not less than 80,00,000 square feet, the area of the Main Line Kyars.
- (2) That its bed should be on firm soil.
- (3) That its levels should be such as to facilitate the discharge of bitterns as far as possible by gravity.
- (4) That it should be compact and as close to its storage platform as possible.
- (5) That its storage platform should adjoin a railway station.
- (6) That its pans should be as large as could be worked, so that all the wind salt, which is unmarketable, should be concentrated in as small an area as possible.
- (7) That a new reservoir site adjoins it and be as convenient as possible for feeding with lake brine. Such a site was found immediately to the west of Sambhar railway station and a new kyar has been constructed there. It is 4,000 feet from east to west and 2,000 feet from north to south. It is on firm sand soil, the southern half being excavated in places 8 and 10 feet deep from the sandy shores of the lake and the northern half partly excavated and partly filled. The northern pans are two and a half feet above the lake bed level the middle pan three and a half feet and the southern pans five feet, the slope allowed being 3 inches in 800 feet towards the north in the outer pans and 3 inches in 600 feet in the middle pans. The storage platforms adjoin Sambhar station and are fed by a high level 2' gauge railway, running round the outside on an embankment, and returning down the centre on a viaduct; both the ascending and descending lines are located on a ramp leading down into the kyar.

The reservoir for the Kyar is the triangular reservoir adjoining its north side above referred to while the Jhapog—Sambhar canal also constitutes a considerable reservoir for it. At present it is provided with a feeder channel along the west side, connecting with the Jhapog—Sambhar canal and the reservoir. The three 12" electrically driven centrifugal pumps could deliver 20 cubic feet a second of brine to it. All channels, the feeder channel, the charging channels and discharging channels are lined with masonry to facilitate cleaning.

Two main permanent lines of metre-gauge track alongside the pans which are connected with the Central Store Nos. 5, 6 and 7 and also with Nos. 2 and 3 run the length of the Kyar from west to east, each being provided with turn outs every 650 feet to connect on movable temporary lines to run into the pans. The total length of track up to the Central Store is $3\frac{1}{4}$ mile. During the extraction, temporary lines are laid in the pans. A series of condensers with a total area of 117 acres have been constructed towards the west of the Kyar.

(vi) *Water Supply*.—Four tank wagons were provided for the metre-gauge system, one or two being attached to each salt extraction train. The Sambhar salt settlement was provided with a piped water supply to all bungalows and quarters except those near the station, fed from an 18,000 gallons ferroconcrete water tank located on the tower on Sambhar hill. The supply is derived from a tube well 60 feet deep some 1,500 feet south east on the landward side; an electric centrifugal pump supplies the tank. A 4" pipe line from this tank feeds two water columns on the metre-gauge, obviating the necessity of wasting an hour or two daily taking locomotives and travelling tanks to Sambhar station where a much inferior quality of water is available in more limited quantities and at a heavy price. Further water columns were erected near the Power House for both metre-gauge and 2 foot gauge the whole being fed from the Sambhar hill tank. At Gudha a pipe line connects a water column in the kyar with the well on Gudha hill. The Sambhar hill tank has been given the form of a Moghul mausoleum, the water being contained between the inner and outer domes. The lower floors provide two useful rooms.

(vii) *Storage and Transport*.—Originally Deodani, Gudha and Jhapog kyars were all worked on the system of local storage. In each there was a central stacking space the full length of the kyar 180 feet wide, flanked by evaporating-pans extending 600 feet on either side, and served by a double siding throughout its length. This involved the transport of salt on buffaloes or men's heads from the pans up to heaps on the central stacking-ground, the maximum lead being 700 feet, and lift 25 feet. Pan paths 8 feet wide divide the pans at 250-foot intervals, but they were almost as slushy as the pans themselves. It was firmly believed that salt could only be successfully made on the black clay at a level lower than the adjoining lake bed-level.

Another grave defect of this system was the necessity for distribution of wagons in twos and threes to many different spots, involving waste of wagon time and hours of work for shunting engines in distributing and collecting them. It also involved much supervision.

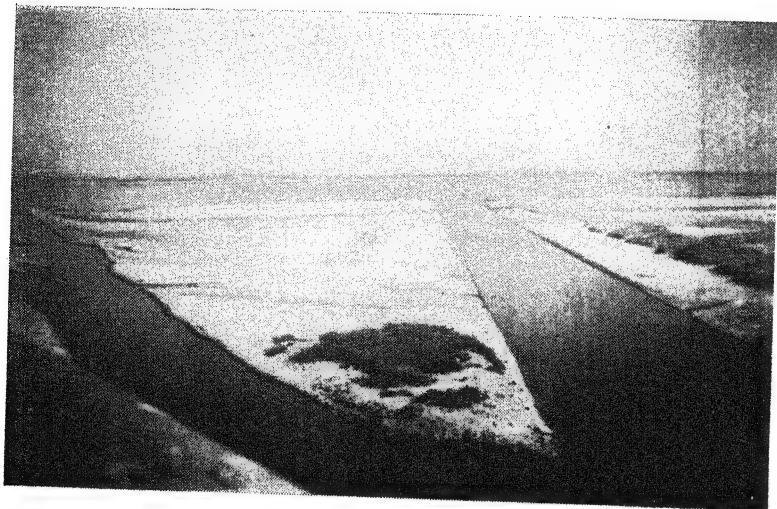
Various methods of transport and storage were studied by Mr. Bunting for instance methods prevalent in France, Egypt, Kharagodha etc. The old system of heaping salt in heaps along-side the pans had to be abolished and it was decided to take all salt to the Central Store to facilitate despatche.

It was decided to remove salt from Deodani and Jhapog pans by means of metre-gauge sidings, but it meant the removal of all pan paths and the construction of longitudinal railway embankments to replace them on sufficiently close intervals, yet not so close as virtually to destroy a large proportion of crystallizing pans. It meant the realignment of all pan charging and discharging channels, innumerable culverts and sluiceways, bridges over the percolation canal and the wide discharging drains between Kyars Nos. 7 and 8, and 9 and 10. A double tract railway with numerous crossways and twelve turnouts for distribution at Deodani and at Jhapog a single track railway with four turnouts were necessary. The Deodani railway had to traverse the outskirts of Sambhar city and develop up Sambhar hill to get height, finally running on to a high embankment, and as was then thought a viaduct 20 feet high and 1,400 feet long. To bring the Jhapog salt in, no such hill was available and a ramp 2,800 feet long and at most 26 feet high had to be made, and a bridge 150 feet long over the then Bombay, Baroda and Central India Railway and our own clearance sidings. In spite of all this the scheme offered solid advantages and the results were certain, so it was decided on. The spacing of sidings in the kyars was fixed at about 200 feet, cutting down the average lead for salt in the pans from 400 feet to 50 feet.

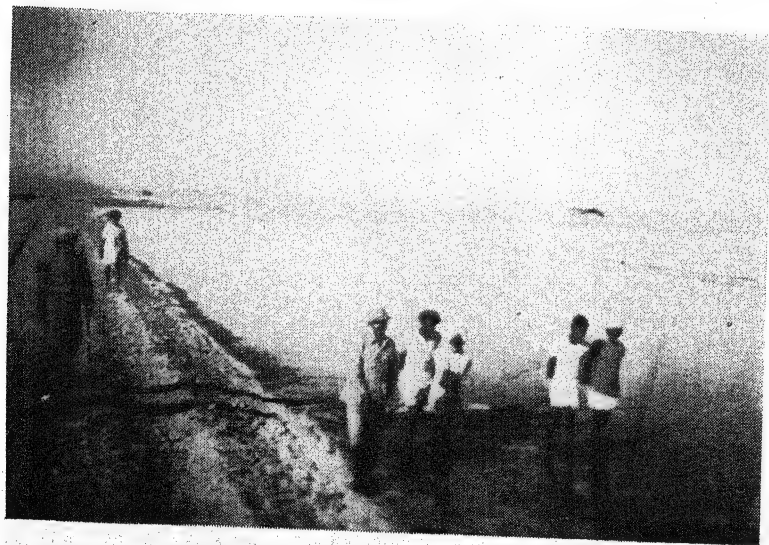
The location of the railway was by no means easy, numerous high cactus hedges obstructed the view, and graveyards and temples were difficult to avoid, especially as graves developed a habit of moving on to the trial centre lines overnight. Up to the last moment a false centre line was sedulously cultivated some 600 feet away, then work was suddenly started on the real one and the graves were not quick enough. Graves had a lot to say to the location of the Central Store too. But the real difficulty was that the Bombay, Baroda and Central India Railway discountenanced any connection with their line between Sambhar and Phulera stations, as this would have involved a new station staff and two block sections on the 5 miles instead of one.

The Central Store had to be dug out of the hill side and as lately enlarged to meet the extra storage required consists of two high-level sidings, north and south, on earth embankments faced on the inside with masonry, and one centre high-level siding laid on salt. The two side platforms are 80 feet wide while the centre platform is 180 feet wide. The average length of the sidings and platform is 1,500 feet and height of the salt heaps on them usually 21 feet. The storage capacity is about 90 lakh maunds. The storage allows salt slopes of 1 to 1 storage up to ten feet from the edge of the platform, a perfectly feasible arrangement, as though ten feet is hardly sufficient for bagging and weighing, the toes of the slopes are very quickly cut away giving plenty of room.

The Jhapog salt comes in to the centre high-level siding and crosses the Western Railway at an angle of 45° . Old girders of the right size and shape not being available, and new ones too expensive it was decided to build the bridge as a 45° skew double T beam of ferroconcrete, with 3 clear spans of 44 feet and one of 21 feet. One of the piers is 'fixed' while the second pier is topped by a layer of tarred paper, roller being resorted to for the abutments. This was the first ferroconcrete girder bridge in India to carry a metre-gauge railway. The two foot gauge railway from the New Kyar crosses on a parallel bridge carried on the same piers. This enables New Kyar salt to come into the main Central Store



Feeder Channels_in the main reservoir



Levelling the bed before charging with brine

Clearance is effected by two sidings between the north and centre platforms and two more between the centre and south platforms. The simultaneous loading capacity is 280 wagons, and allowing 4 hours for loading, two lots of 280 could be loaded in a day.

The Gudha transport and storage scheme, like the New Kyar, is on the two foot gauge system, with two permanent main lines along the edges of the pans, turnouts for each pan for connecting temporary lines during extraction, a collecting line connected to both main lines in the centre of the system and a ramp 1,200 feet long leading to a ferroconcrete triple T beam viaduct 814 feet long and 16 feet high from which salt is dumped. The platform is 814 feet long, 175 feet wide and is served by a metre-gauge clearance line each side; two trains of 40 wagons could be served simultaneously. The capital expenditure was Rs.1,87,000.

(3) *Present System.*—The bed of the lake is composed of a fine black tenacious mud very soft to a depth of about 2 feet from the surface but gradually hardening at lower levels. The lake has no outlet, the supply of water is derived from the rivers Mendha, Rupnagar, Kharian and Khandal that fall into it. During hot and cold seasons they run dry, but during the rains they come in floods and fill the lake 3 to 4 feet deep. Rainfall varies greatly and during the last 75 years it has fluctuated between 10 and 40 inches, the average being about 20 inches. Sambhar Lake is thus dependent for its supply of water on rainfall and on water brought in by these four feeder streams. Temperature, wind velocity and soil are fairly well suited for manufacture. During the months when the lake is dry, March to July, salt deposits in the form of an efflorescence on the surface of the bed of the lake. This is due to the effect of capillary attraction on the reserves of salt in the mud below. This salt efflorescence is renewed annually by a provision of nature and forms the nucleus of the salt supply of the works. In the early stages the water in the lake is just fresh water registering 0° density, but gradually the salt efflorescence is dissolved as the water in the lake is agitated and stirred up by the constant west wind that prevails, and in time it acquires the salinity of sea water, 3° Be'; the loss in volume by evaporation that occurs in this process varying from 30 to 66 per cent. of the water originally present in the lake. The specific gravity of this is 1.03; it rises as the dry hot weather advances to 1.24 (29° Be').

The process of manufacture of salt is fairly simple but involves a considerable degree of practical experience of the varying conditions of brine at different depths and densities. Salt is manufactured by solar evaporation in pans measuring from 3 to 7 acres in area grouped together in clusters or kyars at various points on the edge of the lake. After the close of the manufacturing season and at the beginning of the monsoon, the previous season's bitters in the pans are drained off. The pans are then flushed either with weak brine available or with rain water. As soon as there is a sufficiently heavy shower, wind salt which accumulates near the edge of crystallising pans if left over after extraction is scraped and spread over the beds in a thin layer. (Wind salt is, however, being collected now to meet the demand of the industries and the Bihar market.) The rain water is then allowed to collect in the pans. After the close of the monsoon as soon as the brine in the lake has risen to a density of 3° to 5° Be', it is pumped into the main reservoirs and later when the density rises to 15° or 16° Be', it is pumped into the reservoirs and condensers attached to the kyars (clusters of pans) of each Circle. The pumping is done by mechanical pumps worked in most cases by electricity and in other cases by internal combustion oil engines. The pans are then replenished, when necessary,

either by doubling from one set of pans into another or by drawing brine from the reservoirs, the idea being to obtain a depth of 12 inches by the time the density rises to 25° or 26° Be' about November or December. When the density of brine rises, low density brine from the canals is also fed into the pans. The accretion system is followed and salt is allowed to precipitate until it reaches a density of 29° Be'.

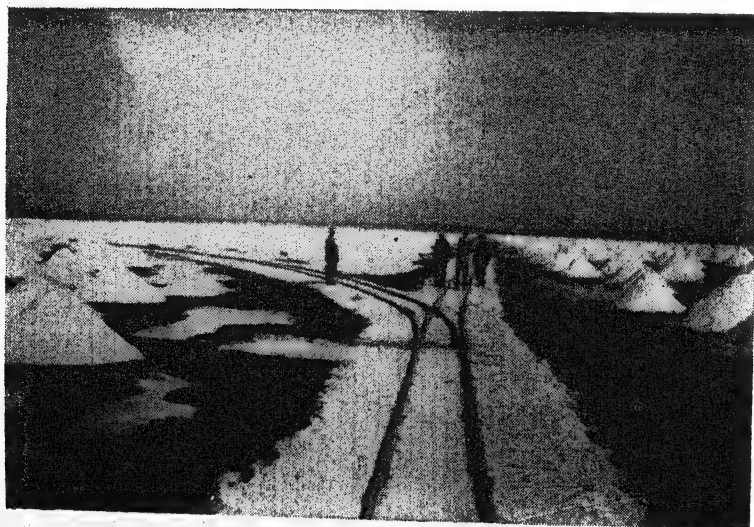
The quality of salt is improved by keeping the density comparatively low from 26° to 28° Be' by fresh admissions of unsaturated brine. If sodium chloride separates slowly from 25 to 27 degrees, the crystals increase in size. The tendency, however, is for it to separate rapidly and in smaller crystals with the progress of the density and under the influence of the impurities. The size of the crystals is increased by retarding the evaporation. The system of accreting the salt is much the same as that employed on the Mediterranean coast of France where the beds are irrigated to a depth of 12 or 18 inches with saturated brine and fresh charges of brine are added from time to time to prevent the density from rising above 29° Be'. The period of manufacture varies from 6 to 8 months. The question whether the density of the brine in the pans should be allowed to proceed as far as 30° Be' is worth discussing. English, in his notes, suggests an ideal density of 29.336° Be' with a brine temperature between 86 and 60° F. The only impurities in the brine to be taken into account are sodium sulphate and sodium carbonate and these are more influenced by temperature than rise in density and the experience of long years has shown that if manufacture commences at 29° Be' and the pans are not pushed up as far as 30° Be' great deal of salt is lost in the bitterns and the outturn proportionately reduced and however ideal in theory it may be to fix upon 29° Be' as the maximum, the analyst's returns show that the salt obtained from pans in which the brine has been pushed up as far as 30° Be' is relatively very pure. The period up to which our accretion of salt is continued is determined by the reserve of brine and considerations of temperature which influence the solubility of both sodium sulphate and carbonate. This period cannot be curtailed without affecting the output considerably. If extraction occurs during the winter months sodium sulphate is the impurity, if in April or later, sodium carbonate. The saturation point for the lake brine is slightly above 26° Be' and not 25° Be' as it is generally taken to be. Replenishments are then continued till March or April in order to obtain a thicker crust. Extraction work generally commences from April and goes on up to June, except in the Main Line Kyars where the work is started much earlier as the Kyars are served by a 2' gauge system and the daily possible output is much less than in the case of Kyars served by the metre-gauge system. In replenishing pans, officers on manufacture take good care to see that brine is free from organic impurities such as 'Nil' or Algae.

The works consist of groups of crystallising beds and accompanying storage reservoirs (the groups being termed 'kyars' or enclosures), and are divided into:—

- (1) The Main Line Kyars which run parallel to the Western Railway metre-gauge track which connects Sambhar with Gudha. It consists of 99 pans of which 40 have been converted into a series of condensers. The crystallising beds have an area of 134 acres.
- (2) The Deodani Kyars with 68 pans and a crystallising area of 332 acres. These are the main works and furnish 40 per cent. of the salt output of the lake. They lie to the north-east of the town and extend to a distance of about 2 miles.



Scraping of salt in a pan before storing



Laying of temporary narrow gauge line for hauling salt

- (3) The Jhapog Kyar some 5 miles from Sambhar on the south-west shore of the lake with 24 pans and a crystallising area of 66 acres.
- (4) The Gudha Kyar some 5 miles north-west of Sambhar on the north shore of the lake with 12 pans and a crystallising area of 72 acres.
- (5) The New Kyar situated about half a mile west of Sambhar station completed in 1924 with 13 pans and a crystallising area of 189 acres.
- (6) Nawa Kyar at the north-west end of the lake opposite Kuchaman Road railway station some 15 miles from Sambhar, with a crystallising area of 90 acres.

At these works the recurring difficulty of brine shortage was met by the construction in 1870 of a coffer dam of mud enclosed between grass and stakes to hold up the brine in the north west area of the lake and prevent it being headed up to Sambhar by a strong west wind leaving Nawa high and dry. This coffer dam ran from Hirakund to the south shore of the lake and fulfilled on a smaller scale the same function for the Nawa works as the larger Gudha-Jhapog dam now does for Sambhar, Gudha and Jhapog. It was kept in repair and occasionally renewed when swept away by floods as occurred in 1882 and 1917 but not re-built when swept away by the floods that occurred in 1924. Canals have also been dug encircling part of the Deodani set of works, also at Gudha and Nawa. They furnish subterranean brine of a density varying from 14° to 20° , but as the quantity is very limited their utility is most noticeable when the season has advanced and manufacture is protracted, when they serve to control the densities of pans. Densities are kept below 30° to prevent other salts such as sodium carbonate or sodium sulphate from precipitating.

Pan Salt

Owing to the failure of monsoon and scanty rainfall in Sambhar for some time with the resultant decline in production, the necessity of tapping the sub-soil brine was felt, to augment the supply of salt and Pan works were started in different circles of Sambhar. The total number of pans is about 1000 and that of Kuls over 500 and 15,00,000 to 17,00,000 maunds of pan salt are produced annually.

(f) *Collection, Storage and Payments*—(1) *Pre-British*.—During Pre-British times, salt was stored by the labourers whenever they chose. The system of storage was crude. The labourers formed their day's collection of salt into small pyramids, scattered near to and around the store which was being formed. In the evening the contents of these heaps were estimated by the valuers of stock in a haphazard manner. They looked at the heap, made a rough guess as to what quantity of salt it contained, and this was recorded by a writer invariably under protest of the labourer, who insisted that his heap was underestimated. After estimation of all heaps was complete, the labourers and writers returned to Sambhar and payments were then made. There were many stores. In short the sites for the storage of salt were fixed in a very haphazard manner. Wherever the labourers chose to extract salt, a store was formed and a guard was placed over it.

(2) *During British Times*.—(i) *From 1870 to 1900*.—In 1870 as many as 29 such sites were being guarded. So to say there were 29 stores. The first step taken by the British Government was to reduce the places to

15 by clearing away the salt from closely adjoining sites. New sites were then fixed where the nature of the shore permitted. The old system with fairer guess estimates was practised as the first attempt at valuation of stock, but before the salt was admitted into the store, it was tested by measurement in boxes of known capacity. This entailed great delay. Then an improved system of measurement was introduced. Rods with length in feet and inches marked off on them placed in the hands of the estimators, the small pyramids arranged on lines marked on the ground, and each labourer made to sit near to his heap. The estimations were then carried on as follows: The officer commenced at the lines of pyramids furthest from the store; the labourer called out his name; the estimator applied the rod to the slope and stated the quantity in the heap in *gons* or portions of *gons*; and the officer recorded the name and quantity and ordered the Treasurer's assistant to pay the necessary amount. The apex of the heap was then knocked off and the payment placed on top of it. By means of this system all disputes were avoided and the subordinates had no opportunity to falsify their accounts. Each labourer stored his portion at once, and all were enabled to reach their homes by dusk in the evening at the very latest. For a short time at first, the workers were opposed to this innovation, but gradually they got used to it. Its adoption in the Nawa-Gudha Sub-Division met with no opposition whatever.

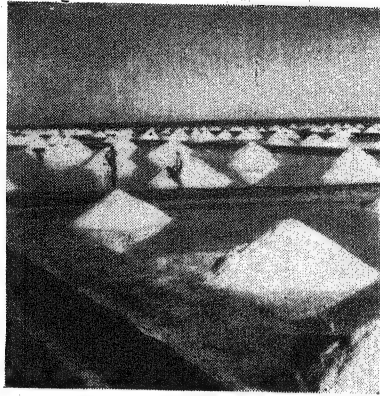
(3) *From 1900 to 1920.*—During these years up to 1917-18, the system of collection and storage as mentioned above continued. Deodani, Gudha and Jhapog Kyars were all constructed on the system of local storage in which there was a central stacking space which was served by a double siding. This involved the transport of salt on buffaloes and on man's heads from the pans up to the heaps on the central stacking ground, the maximum lead being about 700 feet.

An improvement was made during 1918-19. The old system in vogue at the lake of dumping the extracted salt for the purpose of measurement and the payment of labour for innumerable small heaps which had in the evening to be regathered and carried off to the storage heap was abolished. The contract system was introduced and the contractor paid all labourers himself, the Department paying him on the estimated contents of the storage heaps. An immense saving of time and energy was secured under the contract system.

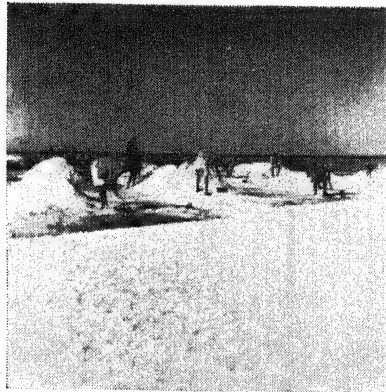
(4) *From 1920 to 1951.*—Under the Improvement Scheme further improvements were effected. The Deodani and Jhapog Transport and Storage Scheme, the Gudha Transport and Storage Scheme and the construction of a Central Store at Sambhar were the main features of the scheme relating to Transport and Storage.

With the increase in production and storage of Reshta and Pan salt additional storage space was required. Central Store No. 8 was, therefore, constructed in 1943-44. Even with this Store it is not possible to keep separate the salt produced in different seasons. Salt is, therefore, being regularly dumped every year on Central Stores Nos. 2/3 since 1943 and this store has not yet been finally cleared.

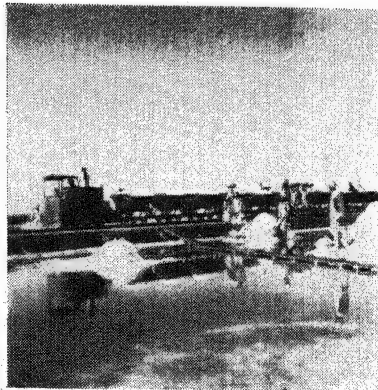
For the clearance of salt the rotation was that while storage went on in one set of stores, i.e., Nos. 1, 4 and 5/6 clearance proceeded at Stores Nos. 2/3, 7 and 8. Similarly when Stores Nos. 2/3 and 7 were being filled, clearance went on from Nos. 1, 4 and 5/6. This is not possible now unless additional stores are constructed.



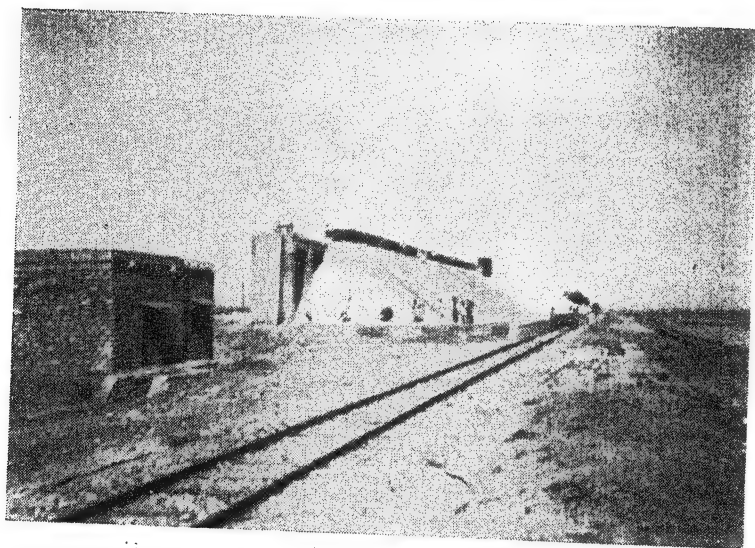
Heaping of salt



Scraping of salt



Loading salt in tipping tubs



Unloading of salt at the stores



Preliminary weighing of salt

The above system had been specially devised so that (1) the seasonal output may be stored separately and (2) the results of clearance of the different stores may be known.

Extraction at Sambhar usually commences in the beginning of April and lasts till the end of June. By this time, sufficient storage space is available at the various Central Stores. According to the system of rotation, Stores Nos. 1 and 4 and 5/6 were cleared one year and Stores Nos. 2/3 7 and 8 the following year. This was done so as to clear the Stores completely and then compare the variations between the book balance and the actual quantity as obtained after clearances. So long as the monsoon is normal, the cycle of operations for extraction of salt and clearances follows with mechanical regularity but if the rains fail, the extraction has to commence earlier, room has to be found for storing the salt and all work is dislocated.

In the Jhapog and Deodani Kyars a metre-gauge track serves the crystallising pans so that metre-gauge wagons can be run along them. The Main Line and New Kyars are served by a 2' gauge line. The tubs are brought by locomotives on to the Central Store and salt unloaded there. The work of extraction from the pans, loading into tubs, transport to and unloading at the Central Store is done by a single contractor. An account is kept of the salt received at the Central Store by Receiving Officers and the contractor paid accordingly. For several years past the contract has been held by the Rajputana Salt Sources Co-operative Labour and Savings Society Limited—a Society consisting of labourers and employees.

At Nawa, which was left outside the development scheme, the salt is taken out from the pans and stored in big heaps by their side. The contractor is paid on the estimated contents of the heaps. 16 lakh maunds salt can be stored at Nawa in these big heaps.

In Rajputana salt is not stored under cover nor is it in any way protected from the weather for in the climate of Rajputana the loss from exposure is slight and the expense of protecting the salt in any way would be far in excess of the advantage it might afford.

(g) *Quality of Salt*—Salt forms in large crystals in the shape of truncated pyramids. In colour the crystals are white grey (owing to the presence of finely divided clay in the fissures of the crystals) and have shades of pink (due, it is believed, to infusoria). The crystals vary from half to an inch or more across the base, their size and solidity varying according to the quality of the brine and conditions of the season. Sometimes the salt is a bit discoloured owing to the fact that in a large number of the condensers and crystallising pans algae are present. Generally the salt is hard and firm, difficult to break down, between the finger and thumb. When badly made it is hollow, light and friable. When salt is collected, care is taken to see that it is not soiled with mud and that it is properly washed in the bitterns and is freed from impurities which can be removed by washing with bitterns and by picking. Sambhar salt contains 98 to 99 per cent. of sodium chloride, 0.5 to 0.2 per cent. of sodium sulphate and .02 to .1 per cent. of sodium carbonate, and 1.3 to 0.7 per cent. of insoluble residue and moisture.

The quality of Sambhar salt from the point of chemical purity only is good; the salt is, however, discoloured to some extent as mentioned above owing to the presence of algae. These minute organisms which are

of a greeny-grey colour when alive, die at varying densities and turn to a deep pink, and their presence tends to impart a pink colour to the salt which crystallises out. There is also some discoloration due to the fact that the beds are soft and contain amount of silt which it is true, can be cleaned out periodically, but of which fresh quantities are brought every manufacturing season. The Tariff Board considered that after crushing the salt would be as white as Indo-Aden fine salt. The Salt Survey Committee (1930) had a number of samples of the salt taken from the store-yards and crushed, and were of opinion that it compares unfavourably with Pachbadra or Khewra salt. They thought that there is a large area which would take either crystallised or crushed salt, whichever be the cheaper and provided the output at Sambhar could be increased and the cost to some extent reduced, there should be no difficulty in extending the present market.

Pan salt

The Salt Survey Committee were a bit uncertain of the reception Sambhar Kyar salt would get in Bengal owing to the fact that its colour is not particularly good. Pan salt which is manufactured from sub-soil brine has the advantage of being free from algae. It is whiter and finer. Experience has proved that it holds its own in the Eastern markets. The quality of Pan salt is more or less at par with that of Kyar salt.

Reshta (wind) salt

In recent years it has been found that fine grain salt secures a ready market in Bihar and is also popular with industrialists. Under the influence of strong westerly winds, there is much wave action in the pans and this causes the salt to be thrown down in a powdery state, generally on the lee side of the salt beds, to which tiny floating particles are blown by the wind.

At the time of collection, it generally has a bluish or pinkish tinge. In the first case, an attempt is made to remove this tinge by washing it with the brine in the pans, and secondly the heaplets are exposed to the action of the sun which bleaches it further. Eventually, when the reshta is ready for transport to the Central Stores, the pinkish or greyish tinge is so very slight as to be hardly perceptible. The reshta being the earliest product of evaporation, its purity is approximately cent per cent. In addition to the reshta salt collected from the crystallising pans, a similar variety of salt has also, since 1939, been collected and stored from the East Lake bitterns area. Physically there is no difference between kyar reshta salt and the reshta salt extracted from the East Lake but the latter is not so pure chemically as it contains about 4 per cent sodium sulphate.

Care during extraction

In the extraction of salt from the pan in the kyars care should be taken that the salt does not get soiled with mud in the process of heaping, that it is properly washed in the bittern, that it is clean and white and free from impurities such as "Makhis" and "Papri" or "Tingani" and that "reshta" (wind salt) which forms along the edges of the pans is not mixed with it. Salt heaped in pans should be allowed to drain for some time before it is extracted and removed to the store. In a good manufacturing season the salt should be large in crystal, well matured and white in colour; any discoloration or the presence of fine grained salt or impurities in such a season is an indication of carelessness in collection and washing. "Tari" forming on the surface of brine must be regularly broken up. If it is not removed it will thicken and settle on the crust thus preventing continuous growth of crystals.

“Tangani” or Papri—a thin crust 1/8" thick having a metallic ring when dry is the result of letting bitters dry on the crust. This is a dangerous impurity containing a high percentage of sulphate and carbonate and is an indication of gross neglect and carelessness in handling manufacturing operations. When a number of pans are ready for extraction simultaneously and there is no brine to control them, bitters should be drawn off thoroughly and crust uncovered at once.

(h) *Production*—The largest output prior to the British occupation of the lake was about 20 lakhs of maunds in 1839. The average about the time of British occupation (1870) was 9 lakhs. The table below gives the figures, in lakhs of maunds, of output from the lake since 1870-71:—

Year	Production in lakhs of mds.	Year	Production in lakhs of mds.
1870-71	11.42	1888-89	60.48
1871-72	14.26	1889-90	20.42
1872-73	15.85	1890-91	58.93
1873-74	16.28	1891-92	34.42
1874-75	25.01	1892-93	0.91
1875-76	16.58	1893-94	44.51
1876-77	1.57	1894-95	70.35
1877-78	59.28	1895-96	51.29
1878-79	39.99	1896-97	30.10
1879-80	5.00	1897-98	18.31
1880-81	29.94	1898-99	53.18
1881-82	32.90	1899-1900	16.38
1882-83	45.84	1900-01	13.79
1883-84	71.11	1901-02	61.76
1884-85	3.76	1902-03	47.44
1885-86	17.61	1903-04	5.72
1886-87	67.35	1904-05	43.49
1887-88	34.97	1905-06	49.94

Year	Production in lakhs of maunds.	Year	Prouduction in lakhs of maunds.
1906-07	49.64	1931-32	71.13
1907-08	31.50	1932-33	68.36
1908-09	62.80	1933-34	71.73
1909-10	67.71	1934-35	68.16*
1910-11	100.05	1935-36	76.23*
1911-12	12.30	1936-37	69.47
1912-13	21.86	1937-38	59.36
1913-14	77.16	1938-39	97.05
1914-15	39.96	1939-40	65.29
1915-16	71.53	1940-41	87.77
1916-17	20.28	1941-42	123.39
1917-18	45.35	1942-43	31.52
1918-19	111.91	1943-44	126.95
1919-20	44.77	1944-45	95.03
1920-21	64.35	1945-46	77.31
1921-22	50.18	1946-47	83.73
1922-23	57.17	1947-48	107.29
1923-24	87.02	1948-49	91.21
1924-25	53.02	1949-50	73.79
1925-26	88.66	1950-51	93.43
1926-27	44.73	1951-52	103.56
1927-28	66.78	1952-53	39.99
1928-29	67.31	1953-54	58.31
1929-30	57.09	1954-55	68.02
1930-31	74.30	1955-56	49.78

*These figures include reshta salt.

There are large variations in output which are almost entirely due to excessive or deficient rainfall, though at times labour difficulties too have played their part. The lowest production on record, viz., in 1892-93 (91,000 maunds) was the result of continuous floods. The low outturns in 1900-01 and 1911-12 were due to failure of the monsoon and those in 1912-13 and 1916-17 to its severity. The maximum output occurred in 1943-44 when a total quantity of 126.95 lakh maunds of salt was produced. The amazing variations that earlier figures disclose are wholly a thing of the past now as the Lake's old dependence on rainfall has been reduced to a minimum by the Improvement Scheme. The figures given above are for official years. It is interesting to compare them with the figures for seasons which may run from October till June. Season figures—showing the quantities produced in the various circles are given below:—

Season	Sambhar including Jhapog	Gudha	Nawa	Total
1900-01	20.07	2.74	20.51	43.32
1901-02	15.08	3.64	13.63	32.35
1902-03	28.89	2.75	15.59	47.23
1903-04	17.53	2.50	12.49	32.52
1904-05	8.77	2.81	19.24	30.82
1905-06	21.32	5.54	20.11	46.97
1906-07	27.86	4.84	23.62	56.32
1907-08	30.22	5.45	18.51	54.18
1908-09	42.34	3.74	15.49	61.57
1909-10	56.99	4.52	18.58	80.09
1910-11	37.84	2.13	8.46	48.43
1911-12	8.47	2.05	7.12	17.64
1912-13	32.58	3.24	11.21	47.03
1913-14	45.03	4.78	19.49	69.30
1914-15	35.08	2.84	11.33	49.25
1915-16	29.22	3.67	13.41	46.30
1916-17	35.78	2.23	10.98	48.99
1917-18	58.64	3.51	15.82	77.97
1918-19	54.28	3.40	16.93	74.61
1919-20	32.26	5.89	7.77	45.92
1920-21	32.98	7.59	8.07	48.64
1921-22	39.95	12.55	17.49	69.99
1922-23	50.53	9.40	20.18	80.11

Season	Sambhar including Jhapog	Gudha	Nawa	Total
1923-24	54.69	7.20	17.79	76.68
1924-25	42.33	4.14	5.45	51.92
1925-26	64.64	8.35	8.17	81.16
1926-27	53.12	6.81	7.15	67.08
1927-28	48.73	6.39	..	55.12
1928-29	50.56	6.93	11.79	69.28
1929-30	43.68	3.73	2.21	49.62
1930-31	68.96	9.91	12.84	91.71
1931-32	48.85	8.64	9.01	66.50
1932-33	55.29	8.42	7.97	71.68
1933-34	55.08	7.93	8.27	71.28
1934-35	51.81	9.64	8.11	69.56
1935-36	53.51	11.86	6.11	71.48
1936-37	46.81	8.79	6.86	62.46
1937-38	51.54	11.27	4.91	67.72
1938-39	37.33	9.08	7.25	53.66
1939-40	87.75	9.36	10.03	107.14
1940-41	67.95	12.05	5.35	85.35
1941-42	56.24	10.02	6.65	72.91
1942-43	73.83	12.03	8.50	94.36
1943-44	88.77	11.59	7.71	108.07
1944-45	62.20	12.53	6.10	80.83
1945-46	60.19	14.20	7.77	82.16
1946-47	78.48	10.89	8.22	97.59
1947-48	77.59	12.30	6.57	96.46
1948-49	56.81	16.14	4.02	76.97
1949-50	71.63	15.72	8.61	95.96
1950-51	76.58	8.11	8.74	93.43
1951-52	88.81	8.59	6.97	104.37
1952-53	25.74	10.62	4.72	41.08
1953-54	51.00	12.47	5.01	68.48
1954-55	40.14	11.56	3.61	55.31
1955-56 . . . . .	..	..	..	69.53

(i) *Cost of Production*—(a) *Pre-British*.—In the pre-British times, the manufacture of salt was conducted at the expense of States. Salt was calculated and sold by Boras, each of which contained 34 maunds. About 12,000 to 16,000 Boras or 4,08,000 to 5,44,000 maunds of salt were manufactured. The cost of this was Rs. 60,000 for labour and about Rs. 20,000 for 'Amlah' or supervising establishment. This was paid equally by the two Darbars Jodhpur and Jaipur. Besides this the former Jodhpur State spent an extra Rs. 30,000 or thereabouts in keeping Swars etc. The net average outturn was about 4,40,000 maunds in 1867-68. This cost Rs. 80,000. Thus the cost of production came to about Re. -/3/- a maund. The salt was sold at Rs. 18/2/6 per Bora or about Re. -/9/- a maund. This was exclusive of transit duties levied by the Jaipur State and was merely the cost price to traders.

(b) *During British Times*.—(i) *From 1870 to 1900*.—The actual cost of manufacture when the Lake was taken over about 1870 came to about Rs. 2 per hundred maunds. The total cost under manufacture and working cost, i.e., charge of establishment, guarding and general supervision came to Re. -/7/- a maund. This was the net cost, but if treaty payments of about seven lakhs were added the cost came to about eight annas a maund.

(ii) *From 1900 to 1924*.—During this period the extraction of spontaneous salt was stopped and the production of Kyar salt was stepped up as it was found more economical to produce this variety of salt than Pan salt. The average cost of production varied from 5·60 pies to 2 annas 10·87 pies per maund.

(iii) *From 1924 to 1947*.—When the Salt Department was commercialized in 1924, several new accounts were introduced and it was found necessary to revise the procedure by which the cost of production was calculated at each source. The more important of the changes carried out were as follows:—

- (a) The amalgamation of the two separate heads "Manufacture" and "Weighment" into one head "Manufacture and Sales",
- (b) The introduction of the Pro-forma account statement for allocating the expenditure under "Engineering Section", and
- (c) *Prime Cost*—In calculating the prime cost, 3·5 per cent of the expenditure under "Manufacture and Sales" apportioned to price has been excluded. This represents the proportion of the expenditure of weighments included under "Manufacture and Sales".

For purpose of calculating the cost of production at each source, the expenditure adjusted in the March final accounts under the following heads was taken into account:—

- (1) Manufacture and Sales,
- (2) Engineering Section,
- (3) Royalty and Compensation,
- (4) Interest on Capital,
- (5) Depreciation charges,
- (6) Share of Headquarters Office,
- (7) Pensionary Charges,
- (8) Contribution of bonus to Provident Fund,

- (9) Sterling overseas pay paid in England,
- (10) Medical Charges,
- (11) Cost of Accounts and Audit, and
- (12) Loss on Engineering Section.

Two very important features in the revised procedure for arriving at the cost of production was the distribution of all expenditure, except the direct charges, booked under "Manufacture and Sales" among "price", "duty", and "despatch" in the proportion of 65, 29 and 6 respectively and the Government of India's decision that the amount to be taken into consideration from the Treaty payments and royalties charged to "Manufacture" on fixing the cost price of salt in the Sambhar Lake Division should be rupees three plus the actual royalty paid on the sales of the preceding year.

During this period the cost of production based on direct charges and both direct and indirect charges varied from 7.22 pies to 1 anna and 11.43 pies and 1 anna and 11.87 pies to 5 annas and 6.87 pies respectively.

(c) *Post British.*—From 1948 to 1955—Before the reins of Government were handed over to the popular representatives in 1946, the British Government had appointed an Officer on Special Duty in 1946 to explore the possibilities of abolishing the Excise Duty on salt and to find ways and means to meet the deficit created by the abolition. On the recommendations of the Officer on Special Duty (Rai Bahadur Shivcharan Das), the duty on salt was abolished from the 1st April, 1947, and Government allowed a refund of revenue to all traders who could show that they actually held stocks of salt on which the refund was claimed. With the abolition of the duty the proportion of expenditure that duty bore as distinct from 'price' and 'despatch' was abolished. The old cumbersome method of calculation was done away with and all superfluous staff employed on preventive duty retrenched.

The cost of production during these years varied from Re. 0/2/2.01 to Re. 0/5/3.84 based on direct charges only and from Re. 0/4/6.88 to Re. 0/14/11.15 based on both direct and indirect charges. The cost during 1954-55 was Re. 0/3/8.71 and Re. 0/6/9.46 based on direct and indirect charges respectively.

(j) *System of sales*—(i) *Old System.*—Before Sambhar was connected by rail all salt was sold to purchasers at the lake. With the railway connection in 1876, salt began to be sent by railway. The through Traffic system was devised to facilitate the supply of salt to the outside public. A system of sale at Government depots or through the agency of contractors existed for some time, but it was abolished. After the war the demand for salt increased enormously. Traders, speculators and others flooded the market with indents. Profiteering traders sold salt at high rates and the public suffered. So the Agency system was introduced in 1920-21. In consultation with District Officers, reliable agents were appointed in each district and were permitted to indent for salt on the condition that they would sell wholesale at a fixed price. This system was abolished in 1924 and replaced by open indenting. A trader had to submit an application at authorised treasuries, sub-treasuries or post offices, which were notified by the Commissioner. With his application the trader had to deposit the duty on and the price of salt applied for at the rates fixed and in force on the day when payment

was made together with all charges in connection with bagging, weighing, loading and despatching of the salt. Traders were required to supply their own bags. The officers in charge of the treasury, sub-treasury or post office in which the revenue was deposited sent the indents direct to the General Manager. If the indent was in order, an authority for the issue of salt was prepared and forwarded to the Superintendent in charge of the Stores. This system continued till 1928-29 when one or two big firms assisted by the credit system put in heavy indents and tried to monopolize the trade. So the system of allotment of wagons on a pro-rata basis was devised. Under this system the quantity of salt to be cleared during any month was notified in advance and traders had to put in their indents by a certain date. No single firm or trader could indent for more than one fourth of the total salt to be cleared during the month. Indentors for 10 wagons or less were classed as small and those for wagons in excess of 10 as large indentors. The number of wagons to be cleared was divided into large and small indentors in the proportion of the total indents of each kind. Large indentors were allotted wagons on a sale calculated on the ratio of the number of wagons indented for to the number of wagons available for allotment to the large indentors. A maximum allotment of 5 wagons to each small indentor was made according to an alphabetical list of the indentors' names till such time as the number of wagons available for the small indentors was completed. The unallotted indents could be refunded or taken in the next allocation. This system was abolished from May, 1933.

Free indenting rules were again introduced from the 1st May, 1933. Under this procedure all the indents were accepted daily by the General Manager at his office up to 1 p. m. on each working day for weekly clearance, provided that the total number of indents received did not raise the daily total of clearance above 125 wagons or such higher number of wagons as the Commissioner in special circumstances determined.

All indents so received were arranged in alphabetical order in one group according to the letter of the day drawn weekly and no allotment to any person in each round of the alphabet exceeded thirty wagons and if after a round of the alphabet had been completed, for any indents remaining to be allotted the procedure followed in the first round was repeated and continued till all the indents received had been exhausted. If the number of indents received in any week exceeded the limit specified above, the balance was returned to the indentors. The revenue deposited in respect of indents so returned was refunded or kept in deposit against further indents at the option of the indentors.

In addition to the indents so received, the Commissioner could at any time authorise the General Manager to accept short-notice indents, provided (a) that no such indents were accepted in excess of a figure which, when added to the regular indents in hand, would raise the daily clearance above 125 wagons, and (b) that deliveries against regular indents should if bags were duly supplied, have priority over deliveries against short-notice indents.

(ii) *During War Time* :— from 1940 to 1942—With the outbreak of World War II in September, 1939, there was a rush at the outside treasuries where there was no limit to indenting. Revenue amounting to lakhs of rupees was deposited by speculators with a view to earn profits as in the First Great War. Early in 1940, it was decided to eliminate speculators and allow only the genuine traders to indent for salt. With this end in view steps were taken to prepare lists of genuine salt traders, who had

indented during the pre-war years. Traders were asked to apply giving details of indents placed by them during pre-war years and about three hundred names were registered in the beginning. Two lists were compiled—one for local traders and the other for outside traders and were sent to the treasuries. The traders had to put in cards with the General Manager from which a lottery was drawn and only those successful in the lottery were allowed to deposit revenue. The treasury officers were instructed not to accept revenue from any others. Under this system of allocation the indents were taken strictly in alphabetical order, but sometimes it happened that indents for which revenue was deposited much later succeeded in the lottery and old indents for which revenue was deposited earlier, were held up. It was therefore, decided that indents would be cleared strictly in accordance with the date of deposit of revenue. All indents in hand were to be arranged according to the date of deposit of revenue into the treasuries in date-wise bundles and a letter was drawn with which the ball was set rolling in the oldest date. After the oldest date was exhausted, the next date was touched.

New traders continued to clamour for registration. Allegations were also made by various traders that some firms had many bogus names registered with a view to get an extra share in the lottery. It was therefore, decided early in 1942 to invite fresh applications. To eliminate bogus indentors, it was ordered that traders should send their applications through the District Magistrates in the case of British India and through the Executive Officer, Shamlat Area, Sambhar, in the case of Sambhar. Thousands of such applications came in and were scrutinised from June to September, 1942. About November, 1942, the Collector decided that he did not want any new names to be registered and would reserve the trade for old traders. He scraped all the applications that had been received through the District Magistrates and the Executive Officer, Sambhar.

The lists of registered traders compiled in the year 1941 were revised, and three fresh lists (A, B and C) of registered traders at Sambhar were prepared and finally approved by the Collector, Central Excise, Delhi, in the year 1943. The Sambhar registered traders, whose names appeared in List 'A' represented 5 units each those in List 'B' 3 units each and those in List 'C' stood for 1 unit each. The registered traders of Sambhar, from all the three lists referred to above, grouped themselves into the four under-mentioned limited concerns in January, 1944.

Sambhar.

1. The Salt Merchants' Association Ltd.	532 units.
2. Shree Shakambar Salt Merchants' Association Ltd.	531 units.
3. The Shakambar Salt Traders' Association Ltd.	278 units.
4. The Chamber of Sambhar Traders Ltd.	195 units.
<hr/>	
TOTAL	1,536 units.

In January 1946, the Collector of Central Excise, Delhi, decided in concurrence with the United Provinces Government to allow the four companies of registered traders at Sambhar, to place indents on requisitions received from the nominees by the 15th day of the month preceding the one to which the nominees' quota related. For this service the companies were allowed to charge a commission of Re. 0/1/6 per maund from the nominees. From the 1st July, 1946, the United Provinces Government in

order to create competition in trade, allowed their nominees to place requisitions to the extent of 50 per cent of the quota fixed for the district, and the four Sambhar companies were only permitted to sell salt against the remaining 50 per cent quota to dealers of their own choice in the same district. If any nominee failed to requisition for his monthly quota in part or in full, this un-requisitioned quota was also allotted to the companies for sale to their own dealers. This arrangement continued till the 31st January, 1947, when U. P. and later the Bihar Government decided that the Sambhar Companies should supply 50 per cent of the district quota to the old nominees against their requisitions and the remaining 50 per cent should be supplied to other dealers nominated by the District Magistrates. The un-requisitioned quota either from the nominee's allotment or from the other dealers allotment was, however, to be allotted to the companies for sale to dealers of their own choice in the same district.

(iii) *Present System*.—The freedom to choose their own dealers brought in its train the temptation to charge heavy premium on the wagons supplied. As in 1942, the premium began to soar and by the middle of the year it assumed gigantic proportions when direct supplies to the Sambhar companies stopped and cent per cent supplies were made to the nominees of the district. The commission of one anna however, continued to be allowed to the Sambhar Companies. This assured an income on all despatches to a few registered traders only and led to natural jealousy amongst the other traders of Sambhar who were not registered in 1943. They in collaboration with the C Class traders carried on a ceaseless campaign to the effect that the registered companies contained a number of bogus names and that the profits should be equally distributed. An enquiry was held by the Salt Commissioner and after eliminating the bogus traders he equalized the shares of the remaining registered traders. This led to a storm of protests and the system of despatch through the registered traders only was abolished in April, 1950, at all the three sources in Rajputana, viz. Sambhar, Pachbadra and Didwana. The nominees are now getting salt on indents placed by their District Magistrates in the treasury against the monthly quota fixed for them. The Sambhar traders were out of trade until recently, when in 1954 some of the State Governments decided to relax the controls gradually, a proportion of the trade was allotted to the Sambhar Salt Traders Association. Free quota is allotted to them and is supplied by them to mofussil traders on a commission of Re. -1/- per maund. Recently (August 1956) the system of allowing 50% of the district quota to the district traders freely through the district treasuries and 50% to the Sambhar traders has been introduced, the traders being free to sell at any commission on competitive basis.

Farodis.—Salt may be obtained for retail sale within a protected area by persons known as 'Farodis'. Under this system a person desirous of becoming a *Farodi* has to apply for grant of a licence to the General Manager. Having got a licence he deposits into an authorised treasury or sub-treasury the charges on the quantity of salt he requires and on presentation of the treasury receipt for the money deposited, is given an authority having a currency for 21 days and is required to dispose of the salt within 4 months, such authority bearing an endorsement that the salt it covers is intended for retail sale within the protected area. The *Farodi* when he has provided himself with a register in which he is required to enter his daily sales, has his salt weighed for removal to the place where it may be stored and retailed by him. A licence may be cancelled, and withdrawn at the discretion of the General

Manager, if the *farodi* fails to comply with rules or if there is reasonable suspicion that he is acting in contravention of the provisions of the Central Excise and Salt Act.

(k) *Selling Price*—When the British Government took over the lease, the selling price of salt was 10 annas a maund. For some years heavy treaty charges were included in the selling price and the selling price varied from 5 to 10 annas a maund. From 1889-90 the Government of India agreed to only a portion of these charges being debited to the sale price of salt; so the price was gradually lowered till on the 1st January 1891 it was fixed at Re. -2/9 a maund. In 1894 it was fixed at 4 annas a maund. It was raised to Re. -4/3 from the 7th June, 1927, to Re. -5/- from the 15th July, 1929 with an additional despatch charge of six pies per maund. From 1st October 1935 the despatch charges were reduced to three pies per maund. The selling price was reduced to Re. -4/3 per maund from the 1st April, 1936. The total selling price in 1943 was Re. -4/6 a maund (Re. -4/3 selling price and Re. -1/3 despatch charges), which has since been raised from 15th March 1950 to Re. -11/9 a maund; price Re. -7/- establishment charges, Re. -3/6, (a charge levied after the abolition of duty from 1st April, 1947) and despatch charges Re. -1/3. This increase has followed in four successive stages owing to the stress of conditions created by the war and consequent rise in prices of the necessities of life.

Period	Price	Estt. (cess) Charges			Despatch charges			Total		
		Rs.	as.	p.	Rs.	a.	p.	Rs.	as.	p.
From 1st May, 1944	0 4 6				0 0 6			0 5 0		
From 1st January, 1946	0 4 6				0 0 9			0 5 3		
From 1st February, 1947	0 5 0				0 0 9			0 5 9		
From 1st April, 1947	0 5 0	0 3 6			0 1 3			0 9 9		
From 15th March, 1950	0 7 0	0 3 6			0 1 3			0 11 9		
From 9th July, 1954	0 10 0	0 3 6			0 1 6			0 15 0		

Bags are supplied by the traders or their local agents.

(1) *Issues and Distribution*.—During the pre-British times the Banjaras were the great distributors of salt. They flocked to the Lake in thousands. Salt was exported by six main arteries to supply the chief markets of the Punjab, Uttar Pradesh and Madhya Bharat. Towards the north it was taken to the salt mart of Rewari to supply the Sirsa, Hansi and Delhi districts. Towards the north-east it was taken to the salt marts of Alwar and Ferozepur to supply the Gurgaon, Rohtak, Bareilly, Mathura, Meerut and other districts. Towards the east it went to Agra to supply Kanpur, Mirzapur, Oudh and some parts of Bundelkhand. Towards the south-east it was taken to the salt mart of Karauli to supply the former Indian States of Gwalior and Dholpur, and in nearly

the same direction it was taken to the salt mart of Jhansi to supply Bundelkhand, Saugor, Bhopal, etc. Towards the south the east it went to the salt mart of Tonk to supply the erstwhile Indian States of Tonk, Bundi, Kotah, Jhalrapatan, etc.

Sambhar was connected by rail in 1875-76. It was extended across the lake to the Gudha pans in 1879 and then extended to Nawa. About 1880, depots were established at Nasirabad, Agra, Delhi and Neemuch. The Delhi depot was opened in 1882 but abolished in 1883-84. The Neemuch and Pali depots were also closed. The Agra depot went on but was finally closed in 1883-84. They were found unnecessary as the Through Traffic System was introduced under which a trader sitting hundreds of miles away was allowed to deposit his revenue into the treasury or post office and get his salt direct. This system and the system of depositing revenue into post office afforded facilities and stimulated rail-borne trade which gradually developed. Salt was carried over the Rajputana, Malwa and Sindhia Railway to Ajmer, Ahmedabad, Agra and Delhi; from Delhi to Lahore and Kanpur over the various railways. The Banjara or road traffic gradually fell off. Nawa salt used to go *via* Kishengarh to Bundi, Kotah, Bhilwani, Hissar, Chambal, Jhansi and Saugor. It took a circuitous route *via* Kishengarh to avoid transit duty levied by Jaipur Darbar. Taking a typical year 1892-93, out of 51 lakh maunds of salt issued, 1 1/2 lakhs was purchased by the Banjaras at the Lake, 19 lakhs went by ordinary rail local deliveries and 30 lakhs was issued under the Through Traffic System. The Banjara salt used to go to Bundi, Kotah, and also by road to Bhilwani, Hissar, Sirsa, Patiala, Shekhawati and Jaipur.

Early in 1901, a partial displacement of Sambhar salt by the Punjab rock salt occurred in the North Western Provinces and Oudh (now U.P.). In any case it was undesirable that a large part of the country should depend on a single salt source at which flood or drought might cause a failure. Salt continued to be distributed to Rajputana, C. P. and the U. P. A major portion of the salt found its way to the U. P. A small quantity went to the Punjab and Madhya Pradesh.

The markets for Sambhar salt have remained fairly constant although during the war years the source was called upon to supply unexpectedly large quantities to Bihar and small quantities to Bengal. After the partition of the country in 1947, which synchronized with the abolition of the Excise duty on salt, supplies of rock salt from the Salt Range Sources in Pakistan to the East Punjab and parts of Uttar Pradesh ceased suddenly. The result was an undue strain on Sambhar. The metre-gauge railway system could not satisfactorily cope with the additional load it was required to take. This coupled with the influx of displaced persons from Pakistan led to complaints of shortage from the markets till then served by Sambhar. Transport is the main bottle-neck which prevents adequate supplies reaching the areas allotted to Sambhar under the quota system introduced during the war. To remedy matters the Government of India decided to rationalize the routes of movement of salt with a view to supplying the needs of the scarcity areas, eliminating unnecessary long haulages and avoiding cross movements. As a result of this decision the Zonal Scheme of Distribution of salt came into effect from the 1st January, 1949 and is continuing since then subject to minor adjustments as may be necessary from time to time. The Sambhar Zone under the above Zonal Scheme comprises the three salt sources at Sambhar Lake, Didwana and Pachbadra and has jurisdiction in the Punjab, Uttar Pradesh, Bihar, West Bengal, Delhi, Ajmer, Himachal Pradesh, Bilaspur, Rajasthan, Pepsu, Jammu and Kashmir, Madhya

Bharat and Nepal. The movement of wagons in this zone has mainly been confined to the metre gauge sections of the Western and North Eastern Railways and the broad gauge sections of the Northern and North Eastern Railways emanating from any of the former Railways within the zone. Although there is a growing demand that all controls on salt should be abolished, the Zonal Scheme of Distribution has worked and is continuing to work very satisfactorily.

(m) *Salt Experts Committee*—The Salt Experts Committee appointed by the Government of India in 1948 also visited Sambhar Lake and after studying the local conditions made detailed recommendations for the development of this source. Some of the main recommendations made by the Committee are given below:—

(1) A detailed geological survey of the Lake bed at Sambhar going down into the primary rock (the micaceous schist) should be carried out. Investigations to ascertain the origin of salt in the different deposits in Rajasthan and the causes for the difference in the composition of the brines should also be undertaken.

(2) (i) The crystalliser beds should be drained off the bitterns before the collection of salt. The beds should be levelled and tamped hard so that the bitterns do not remain behind in puddles. As the beds have a layer of 3 to 9" of slush its removal is essential for improving the quality of salt produced.

(ii) The mother liquor should be drained, condensed brine, nearly saturated, should be let into the crystalliser and the salt crust should be washed in brine before raising.

(iii) All available salt should be extracted from the crystallisers before the outbreak of the rains. Even if it cannot be removed to the stores before the rains it should be heaped in the crystallisers and along the track and transferred to the stores as and when transport is available.

(iv) To prevent any salt being left over in the pans, the method of payment to labour may be modified.

(v) The present crystallising area should be reduced and converted into condensers as conditions warrant. This will reduce the cost of maintenance of crystallisers and facilitate the collection of salt. It will help in increasing the yield of salt and lower the cost of production.

(vi) Two grades of salt should be harvested, one between 26° and 29° Be. and another between 29° and 32° Be. The exact limits should be determined for the different qualities of brine available by preparing a chart showing the progressive separation of salts on evaporation and correlating it to the density and reduction in volume. This work should be done systematically and form part of the routine records and reports of the Works.

(3) The rain water that collects in the East Lake Bitterns Area and dissolves out the bitterns salts is a potentially rich source of common salt and should be exploited. A suitable method of disposal of the sewage of Sambhar town should be worked out to prevent its draining into this bitterns area.

(4) The production of salt in pans, utilising the brine from wells, should be undertaken under direct Government management on a large scale. Improved methods for lifting the brine by pumps should be used and the pans should be laid out on more scientific lines.

(5) A permanent track should be laid from the bitterns area to the stores to convey the reshta salt.

(6) The present method of storing salt should be modified. Mechanical means should be employed for storing, bagging and loading salt in order to simplify the operations, reduce the labour employed and cheapen the cost.

(7) As washing experiment with Sambhar salt has shown the possibilities of bringing about an improvement in the quality, further experiments on a large scale should be conducted with a view to introducing washing as a part of the manufacturing operations.

(8) A detailed investigation of the algal problem, as suggested by the late Dr. S. N. Ghosh, should be carried out at Sambhar by a trained algologist and a chemist.

(9) (i) Among the programme of maintenance of works the cleaning of crystallisers, condensers and the percolation canals should be given the first priority. Mechanical scrapers should be purchased to clean the percolation canals. Dragline tractors which can work from the embankments of the canals might be suitable for the purpose and their usefulness should be investigated. These excavations will also be useful in cutting new canals.

(ii) In the programme of Capital Works the following order of priority should be given among works of major importance and should be completed in the course of five years:

(a) the deepening of the Gudha Sambhar channel and the modifications of the East Lake Bitterns area;

(b) the partitioning of the main reservoir;

(c) the remodelling of Nawa.

(iii) A mechanical washing plant should be installed without delay. The salt should be washed soon after it is raised in order to remove the impurities more easily and satisfactorily and stored only after it has been washed.

(iv) A well equipped laboratory with a suitable staff should be provided for carrying out the routine control tests and investigations of day-to-day problems.

(10) The size of the crystallisers at Sambhar lend themselves easily for mechanical harvesting and the possibility of using them at Sambhar should be investigated.

(11) Additional tipping wagons and locomotives should be provided to ease the transport problem at the works. The tipping wagons should be manufactured in future at the workshop at Sambhar after suitably increasing the equipment and the staff.

(12) (i) The problem of removal of sodium sulphate from the brine or the bitterns should be subjected to a thorough study and investigations carried out simultaneously both in the laboratory and at the works in the field.

(ii) The mixed salt in the bitterns area constitutes a potential source of wealth and should be properly conserved for exploitation after a method has been devised for the recovery of their components.

(13) The administration and the technical staff at the works is inadequate and under the General Manager, the following technical staff should be provided:—

(a) Chief Chemist, (b) Chief Chemical Engineer, (c) Chief Electrical and Mechanical Engineer and (d) Chief Civil Engineer. A cost accounting branch should be added to the Accounts section.

(14) In the interest of labour the composite rate for raising the salt and loading and unloading it should be split up into two different rates. The employment of contractors on manufacturing operations should be gradually eliminated and the labour should be engaged directly by the works.

(15) A careful itemised re-valuation of the assets of the works should be carried out under different heads.

(16) (i) In the items of cost the largest item is the royalty and rents paid to the States of Jaipur and Jodhpur. They should be revised on the basis of the changed political structure of India and also as salt is no longer a source of excise revenue.

(ii) Proper rate of depreciation should be provided in the cost and reserves built up which can be spent usefully for the proper maintenance of the works.

(iii) Costs of salt will be reduced by the employment of pump wherever needed and the introduction of mechanical appliances.

(iv) The salt works should be treated as a commercial venture and fair margin of profit at 10 per cent of the capital block be allowed in arriving at the selling price. 50 per cent of the profits that may accrue should be paid to the General Revenues of the Central Government and 50 per cent towards building a Reserve Fund to be utilised for future expansion and modifications of the works.

(17) The present practice of marketing the salt through a limited number of registered companies is not sound or healthily conceived. Salt should be distributed as widely as possible and no restriction should be placed in the way of the indentors getting their supplies direct from the works if they so desire.

Some of these recommendations have been implemented and others are being implemented to the extent it is administratively convenient.

B.—PACHBADRA

(a) *Historical.*—The following local tradition exists as regards the past history of Pachbadra. It is related that in former times the bed of the valley was a saline marsh in which salt used to deposit during the dry and hot months of the year. The country was even more sparsely populated than it is now. The wild aboriginal tribes of the neighbourhood used to collect this salt for their own consumption and for sale to the inhabitants of the adjoining desert. About 400 years ago a man named Pancha, a Jat agriculturist by caste, lived in and owned a small desert hamlet which stood upon the present site of the town of Pachbadra. The story goes on to relate that 'Mataji' the presiding goddess of the place, appeared in a dream to a well-behaved member of the Kharwal community called Jhanjah, a resident of Dahraseri in the Soojat Pargana and told him to proceed to Pachbadra and excavate a pit, and there salt would be produced for him. This man with about twenty of his brethren carried out the orders of the goddess.

He visited Pancha's hamlet where he settled down and commenced systematic collection and sale of salt. He was joined by other Kharwals and it was in this manner that the present community of about 200 households of Kharwals came to occupy the town of Pachbadra. Several of these families claim descent from the original founder Jhanjah Kharwal. For some time the original settlers collected spontaneous salt from the hollows only. Later on they discovered that brine springs existed not far from the surface and began to dig pits and collected salt from there. By chance it came to light that the best crystals of salt formed upon the thorny branches of a shrub (locally known as *morali*) which were blown by accident into the pits. Experiments were made and it was found that the thorny twigs were best adopted for the purpose as they did not decay in brine and the long thorn facilitated the formation of large crystals. These alleged discoveries of Jhanjah and his brethren form the basis of the methods of manufacture which are followed even at the present time. It is also said that some fifty years later the goddess again appeared in a dream to a descendant of Jhanjah and told him to dig under a certain *jal* (*Salvadora Obesides*) tree, where he would find her image. By carrying out this instruction the salt tract would extend for 10 miles from east to west and for 4 miles from north to south. On relating his dream to the people of Pachbadra, the instructions of the goddess were carried out and the image of two sisters, one called Sambara Mataji and the other Asapura Mataji were found. For the proper installation of these idols the present temple in the Salt Tract, called "Mata-ki-than" was built. This is now a more pretentious building than that which was originally erected by Jhanjah. There is an inscription engraved upon the image which shows that the temple was originally built in 1574 A. D. and has been standing now for nearly 400 years. The shrine is maintained by the contribution of the salt manufacturers and the pious Hindus of other castes in the neighbourhood. The Kharwals present offerings at the temple even to the present day.

Prior to the occupation of the British, the Jodhpur Darbar recovered royalty on the salt produced and also levied a customs duty. Out of the total salt manufactured one-fourth was taken by the State. The duty levied amounted to half-an-anna on each rupee worth of salt. The salt used to go to Mewar and Central India (now called Madhya Bharat). The British Government took over the source in 1878 at an annual rental of Rs. 1,70,000. At that time 534 pits were working. The eastern portion of the tract produced the salt most suitable for Banjara trade, but the brine supply was deficient and so the western section was also developed. The eastern section is now studded with abandoned pits.

This salt source labours under many a disadvantage. About 1925 the source began to lose whatever importance it had and from 1925 to 1928 it was in a moribund state. The total decline of this source with its unpleasant climate, want of water, disabilities of its position and impossibility of successful competition with Sambhar and the indolence of the Kharwals, appeared inevitable. The source worked at a loss and the Government in 1927-28 restricted the annual clearances to three lakhs. However, 1928-29 witnessed a sudden change due to over-indenting and on account of shortage of salt at Sambhar and the tract regained its importance. It has since proved an invaluable adjunct to Sambhar and the output in 1929-30 jumped to about 15 lakh maunds. Production dropped to some extent after that year owing to various causes but since 1946-47 the output has been stepped up and maintained at a fairly high figure inspite of a shortage of brine caused by repeated failures of the monsoon.

(b) *Situation*.—The Pachbadra salt source consists of an oval depression about 7 to 8 miles long and 3 to 7 miles broad. It appears that at some remote period it must have been the bed of a river. It is about 60 miles south-west of Jodhpur and a few miles north of the right bank of the river Luni. It is situated in a sparsely cultivated country. The salt tracts extend over 20 or 25 miles besides the salt source proper. The space occupied by the salt works comprises a length of about 6 miles of the bed of the valley with an average width of 2 miles. The pits from which salt is obtained are scattered all over this area, but the greatest number is in the western portion, so also is the brine stronger in that direction. Pits to the east are silted up and abandoned. In all, there are about a thousand pits but only 400 are working pits. Geologists consider that the salt comes from the Rann of Kutch in the form of fine dust carried by winds that blow over this region. The salt is deposited and is washed by rain. It collects and forms surface and subsoil brine. The drainage from an area of 350-400 square miles accumulates in the Pachbadra basin.

(c) *System of manufacture*.—Pachbadra salt is obtained by the solar evaporation of brine in large pits excavated to the level of the brine springs in the bed of the depression which forms the surface. These pits are on an average 400' long, 100' broad and about 9 to 12 ft. deep. Some large pits 800' \times 90' also exist. Brine having a density varying from 15° to 20° Be' percolates from the sides of the pit and upwards through the pit bed to a depth of about 3' and as evaporation proceeds, the inflow continues, until the pits are full of salt up to the brine level. The thorny branches of a desert shrub called 'Morali' which grow on the sand hills of the neighbourhood are thrown into the brine, when it reaches a density of 25° Be'. This is done to facilitate the crystallization of salt. The day temperature is very high during the hot season and the climate of the desert country in which the source is situated is extremely dry. In the past, salt was usually extracted from a pit at intervals of about 2 years as this ensured that the crystals were of good grain but since 1947, when efforts had to be made to make the country self-sufficient in salt production, crops are being extracted every year. A pit when ready is generally opened 2 months after rains have stopped. The crust usually 3' thick held together by the thorny branches embedded in it, is broken up with iron-shod poles, raked to the side, and spread out for a day or so to dry on a drying ledge just above the brine level. It is then cleared of its impurities and carried up in baskets and piled up in heaps on the edge of the pit. This system of manufacture has been followed for many generations past and is adapted to the local conditions.

It is noticed that pits in sandy soil yield a more copious supply of brine than pits in clayey soil and the density of the brine in the former is usually weaker. In pits which yield a low density brine the salt produced is usually contaminated with gypsum. Apparently at this low density the brine does not get a chance to deposit its calcium sulphate content in the sub-soil before entering the pit. When the brine in a pit is above 20° Be' the salt obtained contains only small quantities of calcium sulphate and when the supply is also copious the salt is relatively purer. It may be that magnesium salts in the brine do not get the same opportunity to contaminate the separating common salt. In the case of pits which have not been renovated for a long time and have a low rate of percolation the salt deposited is largely contaminated with magnesium salts; this is because the magnesium content of the residual brine in the pit rises with the removal of each successive crop of sodium chloride and remains attached to the salt when extracted.

After extraction of the saleable salt in a pit all the fine salt remaining in it is taken out and heaped in a ridge just above the brine level. This process is called 'Ghalni'. It opens out the brine springs and freshens the brine in the pit. During rains the fine salt is dissolved. A thorough cleaning and renovation of the pit becomes necessary after some years. A record of all operations to which a pit is subjected from time to time is kept. The average out-turn from a pit 400' \times 100' is 6,000 to 8,000 maunds.

(d) *Effect of Rainfall.*—The average annual rainfall at Pachbadra is 12". It, however, fluctuates. During the monsoon of 1892 as much as 48 inches of rain fell, while the rainfall of 1899 was only .93 inches. A sudden and heavy fall of rain produces no permanent effect as the water is absorbed in the sand. A favourable rainfall renders the yield from the springs more copious and by diluting the brine tends to the formation of better salt as the result of retarded precipitation during the hot months of the year. A heavy rainfall also covers the tract with grass and bushes.

A deficiency of rainfall has a bad effect on brine springs, the out-turn and quality of salt. The brine becomes too highly concentrated and precipitation of salt goes on too rapidly. Consequently, salt forms in small crystals, which are not clean and pure, and it is not liked by the trade. A prolonged drought causes a fall in the level of the brine springs with the result that with a less depth of brine the out-turn diminishes.

Unlike the Sambhar Lake, however, Pachbadra is not absolutely dependent upon the rainfall for the production of salt as the brine springs are perennial, and salt is obtained even in the worst year of drought, but with a good rainfall the brine is diluted, and as a consequence of prolonged evaporation the salt forms in larger crystals under such conditions. The rainfall is extremely capricious and the climatic conditions are characteristic of the desert country. During the season of the south-west monsoon, the only time of the year when rain falls in an appreciable quantity, immense mass of cloud come up from the direction of the Rann of Kutch and pass over to the north-west without precipitating moisture except erratically. The annual rainfall varies considerably from year to year. For instance in 1930 it was only 3.4" whereas in 1932 it was 22.21" and in 1944, 23.3". Generally it varies between 6" to 12". The rainfall during the last five years is given below:—

Year	Rainfall (in inches)
1951	6.34
1952	11.34
1953	8.9
1954	6.13
1955	14.92

At Pachbadra two qualities of salt are produced and different rates are paid to Kharwals for both these qualities. The present rates (since 15-3-1950) are Re. -/5/9 and Re. -/6/- per maund.

(e) *Storage.*—The Kharwals, the manufacturers, are also responsible for storage of salt. When salt is extracted from a pit, it is first placed in heaps on the drying ledges in the pit just above the brine level to drain

and dry for 48 hours. Afterwards it is removed to the pit bank for storage. It is stored in wedged shaped properly dressed heaps with a rectangular base containing 1 1/2 to 8 thousand maunds of salt; three-fourths of the contents of the heaps estimated by cubic measurements are first paid for, later on excess or deficits discovered on clearance are adjusted. Bad or impure salt is not allowed to be stored.

The labour employed at Pachbadra on the manufacture of salt is mostly local from the neighbouring villages. The Kharwals who claim to have a hereditary right to produce salt in the tract are also the owners of the pits. The labourers work in batches. Those who work inside the pit on breaking the crust and collecting the salt on the drying edges are collectively known as 'Tiran', which consists of about 12 labourers. Those who work on storage are known as 'Odes'. The latter are generally female labourers and children.

In the early days of the extraction season labour is available in plenty. As the season advances and as the heat increases the labourers have to be forced to come to work. In cases of urgency, when the labourers are adamant in not turning up to work, the authority of the Hakim of Pachbadra has to be invoked in order to bring pressure to bear upon the villagers. This, however, only occurs when a good *khari* crop has been harvested. Whenever there is scanty rainfall the labour supply is plentiful, but when the rainfall is copious, the shortage of labour is always acute.

For the last few years (since Partition), the labour supply is satisfactory. This plentiful supply of labour has enabled the Kharwals to consider the digging of new pits to supplement their income from the existing pits.

(f) *Quality*.—Unlike Sambhar where different kinds of salt (Kyar Pan and Reshta) are produced, only one type of salt is produced at Pachbadra. The salt crystals at Pachbadra are irregular cubes. When mature and formed on *moral* bushes some of the crystals exceed an inch and half in length. The size and colour of the salt however varies according to the soil on which it is formed. The tract is divided into three zones called Hiragarh, Posali and Sambra. The salt of Hiragarh used to glisten like diamonds and it was from this fact that the zone derives its name. The best salt was originally produced in the Sambra zone. Posali salt is comparatively inferior, being white and opaque and the crystals are very small. On account of its good quality, Pachbadra salt was preferred in the eastern markets. Even with the greater lead it used to compete favourably with the cheaper Sambhar salt in those markets.

During the war, owing to the increased demand for salt, the quality deteriorated as the Kharwals did not take the same care as they did in the past to set their pits with *moral* thorns which increases the size of the crystals. Later with directives to produce as much salt as possible the efforts of the Circle Officer at Pachbadra has of late been to extract the maximum quantity of salt. Setting with *moral* means waiting for a year and half for the crystals to grow and mature. Quality depend also on good supply of brine, which, in turn, depends on rainfall. The last few years have been successive failures of monsoon. These factors have also contributed to the general deterioration in the size of the crystals and the best salt now produced is merely medium grained.

The quality of Pachbadra salt is, however, much better than that of Didwana. The chief impurities which separate out along with common salt in the pits are locally known as:—

- (i) *Kajji* which consists mainly of crystals of gypsum coated with small cubes of sodium chloride. It separates in the form of lumps, discoloured with adherent clay.
- (ii) *Haim* which is in the form of flakes or clear crystals usually tinted yellow and consists of gypsum, sodium chloride and magnesium sulphate.
- (iii) *Phulia* which is another form of composite crystals of gypsum, sodium chloride and magnesium sulphate; it appears most noticeably during frosty extracted salt.
- (iv) *Jalebi* which is the name given to the encrustations of gypsum on the *morali* twigs along with small cubes of sodium chloride.
- (v) *Anetha* which is mainly gypsum occurring as small opaque crystals or in the form of flakes resembling mica.

At least one, and often several, of these impurities are associated with each pit and it is taken for granted that they cannot be avoided. They can, however, be easily distinguished by a visual examination.

The sodium chloride content ranges between 95·00 and 98·50 per cent. Four samples were analysed and they showed a great divergence in their composition. While the best of the samples contained only 0·43 per cent of calcium sulphate three of the others samples contained almost 2 per cent of this impurity. Similarly while the best sample contained magnesium salts to the extent of 0·32 per cent, one of the other samples contained as much as 2·33 per cent. These divergences are not surprising because each pit is a unit and has its own good points and drawbacks.

(g) *Production*.—The production since 1885-86 is shown in the following table together with the issues:—

Year	Quantity of salt purchased	Clearances
	Mds.	Mds.
1885-86	5,93,820	5,05,225
1886-87	5,47,496	4,91,576
1887-88	10,18,106	7,27,942
1888-89	6,81,046	6,53,453
1889-90	6,74,861	6,26,901
1890-91	4,94,669	4,70,166
1891-92	3,09,253	3,80,120
1892-93	1,15,389	4,80,263
1893-94	7,65,578	12,15,268
1894-95	11,09,214	8,50,818

Year											Quantity of salt produced	Clearances
											Mds.	Mds.
1895-96											7,10,185	6,08,114
1896-97											7,22,765	6,54,102
1897-98											4,96,718	6,05,827
1898-99											7,72,303	7,81,574
1899-1900											10,42,199	11,37,396
1900-01											4,76,811	9,95,605
1901-02											9,83,818	11,11,215
1902-03											6,88,897	6,18,373
1903-04											6,72,633	4,85,188
1904-05											6,52,946	3,69,428
1905-06											4,59,317	4,06,091
1906-07											4,96,617	5,35,623
1907-08											5,67,371	6,17,124
1908-09											5,19,125	5,56,132
1909-10											7,78,498	6,38,292
1910-11											7,12,536	6,81,044
1911-12											8,90,483	7,68,685
1912-13											9,25,394	9,03,298
1913-14											11,08,361	10,14,870
1914-15											7,74,116	10,10,728
1915-16											6,69,711	9,53,976
1916-17											8,31,153	10,01,933
1917-18											5,46,623	5,14,521
1918-19											12,21,426	8,12,336
1919-20											7,07,040	7,46,199
1920-21											13,10,862	4,84,984
1921-22											7,36,347	6,78,373
1922-23											1,72,391	7,53,125
1923-24											10,73,146	4,93,173
1924-25											95,530	7,43,022
1925-26											6,62,822	2,20,679

Year	Quantity of salt produced	Clearances
	Mds.	Mds.
1926-27	56,825	3,01,467
1927-28	11,107	4,20,590
1928-29	5,22,795	6,95,607
1929-30	14,96,192	12,84,444
1930-31	12,20,183	13,51,169
1931-32	5,37,515	7,94,276
1932-33	6,01,373	5,81,920
1933-34	9,68,899	5,82,554
1934-35	10,66,249	6,59,073
1935-36	8,63,072	10,57,539
1936-37	11,81,193	13,70,000
1937-38	12,26,126	12,41,861
1938-39	10,44,052	6,83,093
1939-40	10,03,259	13,20,162
1940-41	13,79,678	13,74,461
1941-42	9,13,359	10,93,356
1942-43	12,51,372	9,26,000
1943-44	7,89,879	8,80,917
1944-45	5,52,106	7,49,597
1945-46	4,95,581	5,19,173
1946-47	13,99,561	10,74,132
1947-48	15,13,671	15,93,328
1948-49	18,30,066	17,62,448
1949-50	14,85,722	16,83,490
1950-51	17,63,700	17,81,518
1951-52	12,57,669	13,17,392
1952-53	7,68,769	9,44,132
1953-54	11,68,277	8,71,582
1954-55	12,01,720	9,81,768
1955-56	8,48,799	9,09,101

The clearances in the above table represent total issues. The production figures are not strictly accurate for the quantity manufactured each year is but an estimate. The production figures vary, but not to such an

extent as in the case of Sambhar. Variations are due to climatic conditions and other factors such as scarcity of labour, restrictions imposed by Government on output etc. The very low output of 1.72 lakh maunds in 1922-23 and .95 lakh maunds in 1924-25 was due to a strike of the pit owners and the imposition of double duty respectively. The high out-turn of 12.21 lakh maunds in 1918-19 was due to the great demand for salt in that year owing to the stoppage of import of foreign salt due to the World war I. No salt was extracted during 1927-28 owing to large stocks being in hand. The large output during 1929-30 and 1930-31 was due to the greater demand on account of a shortage of supplies at Sambhar. There is no artificial restriction on the out-put now and during the last four to five years it has been about 10-11 lakh maunds.

(h) *Cost of Production.*—In olden days the price paid to the Kharwals for the manufacture and storage of salt was about 9 pies per maund. If to this were added the cost of the supervising establishment and the sum chargeable for the rent of the source the average cost per maund would have come to about 4 annas a maund. The cost of production in these days is fairly high. Till 1914 the Kharwals were paid 9 pies, one anna, and one anna and three pies per maund according to quality. Their rate was gradually raised till 1921 when it was 2 annas and 3 pies. It was reduced to one anna and nine pies in 1926. At present the Kharwals are paid Re.-/6/- and Re.-/5/9 per maund for the first and second quality of salt. The total cost of production varies with the total output. During 1929-30 about 15 lakh of maunds were produced and the cost based on direct and indirect charges worked out to three annas and 1.6 pies per maund. With an output of 5 or 6 lakh maunds the average cost rose to about 5 annas a maund. The cost of production during 1934-35 worked out to Re.-/3/10.46 per maund. Pachbadra salt about 1929-30 had fallen into disrepute but 1932-35 witnessed at first a gradual and later a rapid revival of its trade. This was ascribable to the freight concessions allowed by the railway and the improvement in the quality of salt. Pachbadra salt gradually established for itself a definite place in the markets.

The popularity of Pachbadra salt regained by it owing to stress of war conditions was retained by it even after the war. After the attainment of Independence the market for this salt remained steady. Although the cost of production showed a tendency towards increase, its sale remained unabated owing to the allotment of a fixed zone to this source under the zonal scheme. The cost of production since 1934-35 is given below:—

Year	Cost of Production (per maund)		
	Rs.	As.	Ps.
1934-35	0	3	10.46
1935-36	0	5	6.01
1936-37	0	3	10.33
1937-38	0	3	2.17
1938-39	0	2	10.82
1939-40	0	3	2.47
1940-41	0	2	8.68
1941-42	0	3	0.43
1942-43	0	2	10.23
1943-44	0	3	7.49

Year	Cost of Production (per maund)			
	Rs.	As.	Ps.	
1944-45	0	4	9.61	
1945-46	0	5	3.66	
1946-47	0	4	5.58	
1947-48	0	4	4.1	From 1-4-47 to 14-8-47 (Pre- partition.)
	0	4	1.17	(Post-partition).
1948-49	0	6	6.64	
1949-50	0	6	6.94	
1950-51	0	8	5.30	
1951-52	0	9	1.07	
1952-53	0	11	0.92	
1953-54	0	10	2.21	
1954-55	0	10	0.27	

(i) *Method of Sale.*—The Jodhpur Railway was extended to Pachbadra in 1887 and the Through Traffic System was introduced there. Salt began to move over the Rajputana-Malwa, Indian Midland and G. I. P. Railways, Beawar, Bhopal, Bhilsa, Saugor, Jubbulpore and Udaipur were the chief centres of distribution. During 1927-28 the Jodhpur Railway reduced the freight on their line so that the freight on a consignment of salt booked from Pachbadra to any place beyond Sambhar would be no more than the freight on an equal quantity of salt booked from Sambhar to the same destination. This placed Pachbadra on an equal footing with Sambhar. With the opening of the new Railway line from Marwar Junction to Udaipur in the second half of 1935 and the introduction of the new Indenting Rules, new markets in Malwa and Madhya Bharat developed as the distance to these markets by rail from Pachbadra source got much reduced. Two kinds of indenting was in vogue at Pachbadra in January, 1940, namely (i) acceptance of ordinary indents, and (ii) allotment holders' indents. This continued till the end of April, 1941 and was replaced by the permit system from May, 1941 with the object of stopping over-indenting and minimising the work in the treasuries and offices of the Salt Department. The card application system underwent a change from the 23rd February, 1942 and in its place datewise clearance system was introduced. From 1st November 1942, as the salt traders indenting on the Rajputana Salt Sources continued to charge exorbitant prices inspite of repeated warnings, 50 per cent of the clearances from this source were allotted to ordinary trade and 50 per cent were reserved for out of turn clearances for the nominees of the District Magistrates in the consuming areas. With effect from that date the claims of only those Sambhar traders, who had previously been indenting for Pachbadra salt in any one of the years 1926 to 1939, were also, taken into consideration. From 1st April, 1943, the lottery system was again introduced. The indenting rights were however reserved for the registered salt dealers and no revenue was accepted from the nominees of the District magistrates. In April 1946 the registered dealers formed themselves into two companies, the Laxmi Salt Trading Co., and the Pachbadra Salt Traders Association. The share of these companies was in the ratio of 38 to 31 and they had to supply salt to the nominees of the District Magistrates at a fixed commission of one anna per maund.

To this number was added a third company viz. the Refugee Salt Syndicate with effect from the 1st October, 1948 and the shares were refixed in the ratio of 38:31:31.

With effect from the 28th April, 1950 the registration of traders for the purpose of allotment of wagons was abolished leaving the salt nominees free to buy salt directly or through their local agents duly appointed under a regular power of attorney.

After the attainment of independence, a system of zonal distribution of salt was introduced. Pachbadra salt has thus an assured market now. It has not to depend upon either its good quality or a bounty from the Railways to find a market for itself. Nature has, however, been very unhelpful to Pachbadra during the last few years as rainfall has been very meagre resulting in short production with consequent short sales after the departure of the British. The salt now goes to Uttar Pradesh, Madhya Pradesh, Madhya Bharat, Rajasthan and Bihar.

(j) *Selling price.*—The lease of the source was taken in the year 1878. Before the year 1882, the selling price of salt ranged between 2 and 5 annas a maund according to quality. A uniform selling price of Re. -3/6 was fixed in the year 1882-83 based on the average price of salt. It was reduced to Re. -1/6 in 1902. In the year 1921, the price was raised to Re. -3/6 but was reduced to three annas a maund in July, 1926, when the wages of the Kharwals were reduced by six pies. Soon however, in June, 1927, the price was increased to three annas. On account of its greater lead it has always been a problem with Pachbadra to pay for itself and there have been frequent rise and fall in the selling price of Pachbadra salt according as the source began to show a loss or the sale of salt began to dwindle. In 1934, the price was reduced to Re.-3/9 with an addition of nine pies on account of despatch charges. The selling price was reduced to Re.-3/6 in April 1936 and with a reduced despatch charges of 6 pies. It remained at -3/6 upto 1942-43. Since 1942-43 the price has been steadily on the increase. It was Re.-4/- per maund with -1/6 as despatch charges in 1944-45 and Re.-7/- with a despatch charges of -1/- in 1950. This rate continued until the 9th July, 1954 when it was increased to 10 annas per maund with a despatch charge of one anna and nine pies.

(k) *Issues and Distribution.*—In pre-British days Pachbadra salt was consumed in the country lying to the west and south of the source. Towards Jhansi it had to compete with Sambhar salt. It was the principal salt consumed towards Saugor. It used to go to Hoshangabad in Madhya Pradesh, but was gradually replaced by Bombay salt. About 1878, when the source was taken over by the British Government the 11 lakh maunds of salt that was sold that year was distributed as follows:—

	Maunds
For Marwar (now part of Rajasthan)	1,40,000
Towards Harauti, Lalitpur and Jhansi	1,00,000
Towards Bhilsa and Saugor	1,50,000
Towards Bhopal and Hoshangabad	3,10,000
Mewar (now part of Rajasthan)	3,00,000
Indore	1,00,000
TOTAL	11,00,000

Formerly salt from pits had to be conveyed to the Railway station on pack animals, and there it was weighed and loaded into the metre-gauge wagons of the Jodhpur Railway. Rs. 30,000 were sanctioned by Government for two sidings, one 6,600 feet eastwards and the other 12,500 feet westwards and extension of the railway line through the tract and the sidings were constructed in 1905. Since then direct loading from the stores into the wagons is possible. Salt is weighed into $2\frac{1}{2}$ maunds bags by petty officers. The bags are carried to selected sites served by railway sidings where they are test-weighed as at Sambhar by Inspectors or Deputy Superintendents who test-weigh 20 per cent of the bags. Salt is also issued to Banjaras through a contractor. These issues had been distributed as follows:—

Statement showing the Distribution of Salt

(Figures in lakh maunds)

Year	Bihar and Orissa	U.P.	Delhi and Punjab	Madhya Pradesh (C.P.)	Rajas- than	Madhya Bharat (C. I.)	Sind (now in Pakis- tan)	Bengal	Total
1	2	3	4	5	6	7	8	9	10
1906-07 .	..	.27	..	1.16	1.64	2.27	.007	..	5.35
1907-08 .	..	.19	..	1.30	2.62	2.04	.018	..	6.17
1908-09 .	..	.05	..	1.06	2.54	1.89	.009	..	5.56
1909-10 .	..	.09	..	1.26	2.87	2.13	.019	..	6.37
1910-11 .	..	.69	..	1.26	2.98	1.86	.018	..	6.81
1911-12 .	..	1.35	..	1.36	2.37	2.59	.014	..	7.68
1912-13 .	..	1.56	..	1.74	2.77	2.95	.021	..	9.03
1913-14 .	..	1.87	..	2.19	2.51	3.51	.018	..	10.15
1914-15 .	..	2.80	..	2.11	3.05	2.10	.040	..	10.10
1915-16 .	.48	2.42	..	1.87	2.72	2.04	.010	..	9.54
1916-17 .	.31	2.57	..	2.14	2.84	2.16	..	..	10.02
1917-18 .	.48	.60	..	.06	1.75	2.25	..	..	5.14
1918-19 .	.24	.92	..	1.01	4.31	1.53	..	..	8.01
1919-20 .	.05	1.81	..	1.02	2.86	1.71	..	..	7.45
1920-21 .	.01	.04	..	.83	2.30	.77	..	..	4.85
1921-22 .	..	.80	..	1.06	3.32	1.60	..	..	6.78
1922-23 .	..	.53	..	1.10	3.22	2.68	..	..	7.53
1923-24 .	..	.13	..	.88	2.99	.93	..	..	4.93
1924-25 .	..	.30	..	2.01	3.19	1.93	..	..	7.43

1	2	3	4	5	6	7	8	
1925-26 .	..	..	..	..	2.18	.02	.5	.. 2.70
1926-27 .	.06	.05	..	.19	2.56	.10	..	.. 3.01
1927-28 .	.24	.74	..	.17	2.80	.25	..	.. 4.20
1928-29 .	.18	2.37	..	.25	3.84	.16	..	.. 6.80
1929-30 .	.04	6.77	..	.65	4.21	1.08	..	.. 12.75
1930-31 .	..	8.36	..	1.01	3.00	1.10	..	.. 13.47
1931-32 .	..	3.77	..	.85	2.47	.74	.02	.. 7.85
1932-33 .	.02	1.93	..	.19	3.18	.27	.01	.. 5.60
1933-34 .	.04	1.72	..	.25	3.53	.22	.01	.. 5.77
1934-35 .	.06	2.20	..	.24	3.53	.48	.04	.. 6.55
1935-36 .	.07	4.41	.08	.77	3.77	1.45	.02	.. 10.57
1936-37 .	.05	6.91	.09	.95	4.31	1.37	.02	.. 13.70
1937-38 .	.06	5.66	.56	1.05	4.37	1.23	..	.. 12.42
1938-39 .	.01	1.75	.01	.38	4.25	.40	.02	.01 6.83
1939-40 .	.63	4.96	.13	.66	5.57	1.24	.01	.. 13.20
1940-41 .	.73	5.53	.16	.73	6.14	.44	..	.01 13.74
1941-42 .	2.93	2.43	.01	.38	5.16	..	.02	.04 10.93
1942-43 .	1.96	2.44	..	.31	4.51	..	..	.25 9.26
1943-44 .	.59	1.18	.01	.10	6.93	..	..	.. 8.81
1944-45 .	.88	1.82	..	..	5.60	..	..	.. 7.50
1945-46 .	.04	0.95	..	..	2.08	..	..	.. 3.07
1946-47 .	3.74	1.59	..	..	3.14	..	..	.. 8.47
1947-48 .	2.13	4.42	1.19	..	3.19	..	..	.. 15.93
1948-49 .	1.41	6.86	.8	..	8.55	..	..	.. 17.62
1949-50 .	.64	26.53	6.40	..	17.14	..	..	.. 50.71
1950-51 .	2.10	2.7	5.4	..	7.6	..	..	.. 17.8
1951-52 .	1.25	3.22	2.12	..	5.38	..	..	.. 11.97
1952-53 .	2.41	.05	.56	..	5.42	..	..	.. 8.44
1953-54 .	..	1.05	2.00	..	4.76	..	..	.. 7.81
1954-55 .	..	..	2.51	.19	6.38	..	..	.. 9.08
1955-56 .	..	..	1.13	..	7.22	..	..	.. 8.35

The system of distribution has practically remained the same after the departure of the British as it was during their regime, except that salt, which was despatched to nominees of District Magistrates through local registered companies, is now despatched direct on the indents of the nominees or their agents. The unit of a wagon-load of salt which weighed 267½ maunds has now been fixed at 295 maunds. This has made the Pachbadra unit uniform with Sambhar wagon-load, and it is possible to transfer indents from Sambhar to Pachbadra without much inconvenience in accounting. Its natural disadvantage of greater lead than Sambhar has been overcome by the introduction of the zonal system of distribution of salt since 1950. Under this system a certain area is assigned to Pachbadra salt source and various kinds of salt are not allowed to compete with Pachbadra salt.

(l) *Potentialities of the source and Recommendations of various Committees for Development.*—The output of the source has varied from 4 to 18 lakh maunds. The question of the potentialities of the source is a vexed one. The Salt Survey Committee considered the source capable of producing 40—50 lakh maunds per annum. They recommended a thorough topographical survey to be done and thought that when fully developed Pachbadra could produce 1,00,000 tons for the Bengal market. The topographical survey of the Pachbadra salt basin was completed in April, 1932. A rough provisional scheme for the expansion of the salt source at Pachbadra and crushing of salt for supply to Bengal was formulated by the Northern India Salt Revenue Department. It involved an expenditure of over Rs. 10 lakhs and provided for:—

- (i) the layout of 25 long pits of the outside dimension of 3,207' × 167' in about 5 square miles of land sub-divided into 6 compartments. Each large pit was expected to yield about 1,20,000 maunds of salt per annum, and
- (ii) transport of the salt extracted from these pits by mechanical haulage direct from the pits to a Central Store where the salt would be crushed, bagged and loaded for the Bengal market in the Railway's metre-gauge sidings and then railed to its destination

Besides, it is also possible to manufacture at a small cost good edible pan salt from sub-soil brine. Pan salt can be manufactured quickly and can be made to augment the supply of pit salt. This scheme, however, was not proceeded with as it was felt that owing to long railway lead, Pachbadra salt could not compete successfully in the Bengal market.

(m) *Salt Experts Committee's views (1950).*—The Salt Experts Committee went into this question carefully and examined the various schemes. They were of the view that the production at Pachbadra should be developed. They thought that if 100 pits were renovated every year, production could be increased by about 4-5 lakh maunds. Overall they thought that the output at Pachbadra can be raised to about 40 lakh maunds per annum by renovating the existing pits. The programme of renovation, however, had to be determined with proper regard to siding facilities. New pits were to be dug only if there were enough indications of copious supply of brine. For cleaning, etc. of pits, they suggested that adequate advances should be granted to the Kharwals.

As regards the improvement of quality, it was felt by the Committee that so long as the pit method of manufacture is followed the contamination of salt with gypsum can scarcely be avoided. This contamination

with magnesium salts, however, can be remedied by pumping out the discarded bitterns out of the pit and throwing them at some distance away from it. They suggested provision of a separate pan for bitterns so that the magnesium chloride could be recovered and crude salt having a higher ratio of sodium chloride could be thrown into the pit to enrich the brine. The Committee also suggested that if possible the method of lifting the brine itself and evaporating it in suitable condensers and crystallisers should be considered. This proposal, however, is a radical departure from the present practice and will require a top dressing of plastic clay which may have to be brought from a distance. This alternative could be investigated only as a long-range plan.

As regards the proposal to construct a Central Store near the station, the Committee were of the view that with the facilities of siding running right through the works, the storage and loading of salt should continue within the works area itself as hitherto and they did not think that the proposal to have a Central Store near the station was justified.

C.—DIDWANA

(a) *Historical*.—The antiquity of the town appears to be considerable, and it is said to have been in existence about 2,000 years ago. It is related that on one occasion when an excavation was being made, a stone idol was found bearing the date of Samvat 252 of the Hindu Era, equivalent to 195 A. D. In digging the foundations of new houses and wells, articles of pottery have been found twenty feet from the surface. The general level has gradually risen above a very ancient temple in the town until only the top of its spire is now visible. The ancient name of Didwana was "Abaha Nagri". In the year 628 A. D. it was revived by Seth Didu Shah and subsequently it was named Didwana after him. With the march of time it also underwent vicissitudes of life. It changed hands several times remaining under the sway of one ruler or another. For a time it remained under the domain of Muslim rulers and then passed on to the control of Rathores. Finally Maharaja Barkat Singh brought it under his suzerainty and permanently annexed it to Marwar. It formed part of the former Jodhpur State until its merger into the State of Rajasthan. It is now an important subdivision of the Nagour District of Jodhpur Division.

Salt manufacture at this source is of great antiquity. The greater number of salt factories (a well with its evaporating pans is termed a factory) has been in existence for centuries. There are no traces of any old works to be seen. It is said that manufacture has been carried on by the present class of workers for the last 450 years and there is no tradition of salt having been produced prior to this period. But in 1878 an experimental well was sunk on the eastern edge of the source on a high level and an excavation laid bare the mouth of an ancient well at a depth of about 8' from the present surface level. This well was about 3 feet in diameter and 10 feet in depth; its bottom was just above the brine springs and a beam of wood was lying across its mouth. It was quite different from the wells at present worked and there is no tradition of salt having been produced so high up on the edge of the depression. It must have been sunk when the level of the source was 8 feet lower than at present. The present race of manufacturers have worked the source ever since the colonization of Marwar by the Rathore Rajputs for about 560 years. It is evident that the well then discovered must be of great antiquity.

The source extending over a total area of 1910 acres was leased by the British Government from the former Jodhpur State in 1878 for an annual rental of Rs. 2,00,000. With the attainment of Independence and the formation of the Rajasthan State, a revised treaty has now been executed between the Central Government and the Rajasthan Government to cover all salt sources located in the former Jodhpur and Jaipur States.

(b) *Situation, Description etc.*—The salt source of Didwana is situated in the district of Nagour in the Jodhpur Division at a distance of about 40 miles north-west of the Sambhar Lake. It is connected with Sambhar by a heavy sandy road, leading along the north shore of the Lake as far as Nawa, and thence on past Meetree, Sargot, Kuchaman City and Daulatpur. The source lies in a valley about $3\frac{1}{2}$ miles in length and $1\frac{1}{2}$ miles in breadth, running south-west and north-east, and bounded on its western side by an isolated spur of the Aravalis.

The town of Didwana lies to the north of the depression at its north-eastern end. It is a handsome stone-built town walled in and fortified, standing on a slightly rising eminence, and possessing many fine houses. It is now the headquarters of a Sub-divisional Officer. The existence of the salt source has enhanced the importance of the town and increased its business. It is connected with Delhi, Bikaner, Degana, Jodhpur and Kuchaman Road by rail and has considerable trade with Bikaner, Shekhawati, Bhiwani, etc.

The salt source of Didwana is situated at a short distance to the south of the town. It consists of an oval-shaped depression in the country, surrounded by sand hills, some $3\frac{1}{2}$ miles long and a quarter mile broad, its longer axis lying almost due east and west. About three-quarters of a mile from each end a dam or bund is built across the depression cutting off the centre portion from the ends, the object being to prevent as far as possible the drainage of the surrounding country from reaching the centre space within which salt manufacture is carried on. The length of the centre portion of the depression is about $2\frac{1}{4}$ miles. The length of the two bunds is 2,465 yards and 1,556 yards respectively. These bunds have to be kept in thorough repair. But for these dams, the greater part of surface drainage would find its way to the centre of the marsh and not only damage the wells from which brine is obtained every year but cause the brine to be weakened by percolation and materially retard salt manufacture. The retaining walls are about 4 feet high, 8 feet thick, at the base and 3 feet thick on top. They are strengthened and repaired every year before the rains.

The valley in which the salt source lies has the appearance of having been the bed of a river. To the north-east and south-west, it has apparently been overwhelmed with sand, but its continuation in both directions can be distinctly traced. The prevailing wind is from the westward and the depression as it exists has evidently been saved from the advancing waves of sand by the span of the Aravalis in the direction contiguous to it, which has served as a protection. Local tradition maintains that the valley was once a river which flowed from the north-east and which became choked with sand higher up in its course. The strata of the bed of the depression consists of a layer of 10' to 15' of black silt like Sambhar, below this is a shallow layer of *kunkar* and lower still a few inches of calcareous deposit. Below this are the brine springs. The total area developed for salt production at present is 256 acres, which is divided into two parts about three-fourths of a mile distant from each other, one known as South Dariba Mata 140 acres and the other North Dariba Bore of 6 acres.

(c) *System of Manufacture.*—The salt works extend over about one square mile in the centre of the depression which forms a shallow lake. After the rains the depth of the main portions of the lake is 2' to 3'. This disappears by percolation and evaporation. In the centre circular wells 6' in diameter and about 10'-12' deep are dug. To prevent the sides from falling in, strong stakes are driven firmly into the mud and lighter stakes are interlaced with them. Brine flows into the wells through the calcareous bed. Shallow evaporating pans are made around these wells. One well feeds 2 to 10 salt pans. All the old working pans are not of uniform size and have been laid out haphazardly, the average size being 100' × 75'. In 1941 however, some of the Deswals were permitted to construct 121 new pans in the Mata and Bore Daribas and these are regular in shape measuring 100 feet by 75 feet and laid out systematically. The pans are about one foot deep, and are prepared by running brine into the clay bed of the depression. The bottom and sides of the pans are kneaded and worked so as to be smooth and free from cracks and watertight. During the hot season large crystals of sodium chloride and sodium sulphate form in the clay and eventually a hard crust is formed on the bed and lasts for many years. After each monsoon all that is necessary is to clear the mud and the pan is ready for the season's output. Lever lifts raise the brine from the wells to the channels which fill the pans. When salt forms it is scraped up in low ridges. The ridging of salt is steadily carried on from the time precipitation first begins until the crop is ready, the position of the ridges being moved from day to day so as to immerse all the crystals in the brine. This process is necessary to prevent the small crystals resulting from rapid precipitation from forming in a cake in the bed of the pans. It also induces the formation of large agglomerated crystals. The first crop is ready within 3 or 4 weeks, the actual time depending on temperature, wind velocity, etc. The next crop is ready within two weeks, since heat and wind velocity increase. Extraction commences when the crust is two to three inches thick. Salt is raked up into heaplets in the pan and allowed to drain and dry after which it is lifted by head loads and stored in rectangular shaped, well dressed heaps for measurement and estimation. Salt can be produced in large quantities as the brine supply is abundant but owing to the high percentage of sodium sulphate in the brine (19 to 31 per cent), it is practically impossible to produce salt fit for human consumption and containing a minimum sodium chloride content of 94 per cent during the summer months. After Independence and the partition of the country, steps were taken to make the country self-sufficient in salt. Production was, therefore, allowed from October to July every year. This resulted in an enormous increase in production and the peak figure of 14·85 lakh maunds of salt was reached during the year 1948-49 manufacturing season, the advent of quality control and the fixation of a standard for salt intended for human consumption however have forced a curtailment of the period allowed for manufacture and the season now extends from October to April only. To compensate the Deswals for this loss in income, 180 new pans 100 feet by 50 feet were allotted during 1954-55, but the ownership of these new pans vests in the Government and the allottees will only be allowed to work them subject to their giving satisfactory service. To encourage the Deswal workers who do not own pans and the non-Deswal workers, who were exploited by the Deswals in the past, 107 new pans have been allotted to them and in addition some pans have been allotted to displaced persons, who have settled down at Didwana. A special feature of these new pans is that they have been provided with eliminators so that efforts can be made to take advantage of the low night temperatures that prevail during the winter season to free the brine of the major portion of its sodium sulphate

content. The total number (553) of pans now being worked in the Mata and Bore Daribas is 345 and 208 respectively. These figures are inclusive of the 180 new pans recently allotted. A shortage or excess of rainfall affects the source to some extent but not to the extent that Pachbadra is affected. The works are well protected from excessive rain by bunds and the reserve of sub-soil brine is sufficient.

(d) *Storage*.—Before the salt is estimated and allowed to be stored, representative samples are drawn from all the rectangular heaps and sent to the Deodani Test Laboratory for analysis. On receipt of the results the contents of the heap are estimated by measurement and the Bapidar directed to store the salt. Two heaps are built up simultaneously in both the Store yards—one to accommodate standard salt containing 94 per cent and above sodium chloride and the other sub-standard salt containing less than 94 per cent sodium chloride. Salt containing less than 80 per cent sodium chloride is rejected outright. For the salt produced in the Mata Dariba the storage is done by bullock carts, camel carts and motor trucks whereas in the Bore Dariba it is done by head-loads owing to the short distance involved. With the allotment of new pans, the majority of which fall in the Bore Dariba area the system of storage by head-loads will have to be changed and storage will have to be done by carts and motor trucks. At the store yards, which are located on the northern and southern sides of the lake well above the normal flood level, the salt is stored in large wedge shaped heaps with a rectangular base. Each heap contains approximately one lakh maunds of salt and payment is made to the Deswals and other allottees on the basis of 85 per cent of the quantity estimated when the individual heaplets are measured. As no railway sidings exist at the store yards the traders have to make their own arrangements for the transport of the salt bags to the Marwar Balia Station at a distance of about $1\frac{1}{2}$ miles.

(e) *Quality*.—The quality of the average salt produced at Didwana from a chemical point of view is poor. This is due to the fact that the sodium sulphate content of the brine varies from 19 to 31 per cent while the sodium chloride content varies from 65 to 77 per cent. It is the presence of this sodium sulphate that causes the quality of the salt to deteriorate especially during the summer months as since the introduction of quality control, it has been established that if a little care is exercised it is possible to produce chemically pure salt fit for human consumption during the period November to March. In physical appearance also the salt is inferior to Sambhar salt because it gets discoloured during collection and storage. In spite of this fact Didwana salt is preferred to Sambhar salt in certain markets.

(f) *Production*.—The table below gives the figures of output. Output from 1878-79 to 1899-1900 has been given in some typical years only. From 1903-04 onwards it has been given for each year:—

Year	In lakh maunds	Year	In lakh maunds
1878-79	5.54	1894-95	4.16
1880-81	3.85	1899-1900	2.38
1885-86	4.91	1903-04	2.14
1890-91	2.64	1904-05	2.94

Year	In lakh maunas	Year	In lakh maund
1905-06	3.47	1931-32	4.55
1906-07	2.86	1932-33	2.51
1907-08	3.35	1933-34	2.00
1908-09	2.90	1934-35	1.52
1909-10	2.73	1935-36	2.15
1910-11	3.17	1936-37	1.63
1911-12	4.04	1937-38	1.78
1912-13	3.27	1938-39	3.52
1913-14	2.89	1939-40	2.57
1914-15	3.78	1940-41	2.72
1915-16	3.51	1941-42	3.66
1916-17	4.22	1942-43	5.34
1917-18	1.97	1943-44	6.17
1918-19	3.32	1944-45	6.35
1919-20	5.18	1945-46	6.11
1920-21	2.71	1946-47	8.17
1921-22	6.92	1947-48	11.63
1922-23	7.49	1948-49	14.85
1923-24	3.23	1949-50	13.92
1924-25	4.02	1950-51	14.40
1925-26	1.23	1951-52	16.76
1926-27	3.75	1952-53	12.80
1927-28	3.17	1953-54	9.36
1928-29	2.87	1954-55	7.21
1929-30	4.98	1955-56	4.44
1930-31	5.34		

The above figures are for financial years and include excesses found on clearance of heaps within a year. Deficits are very rare. The production, it will be seen, varied considerably from 2 to 7 lakh maunds prior to 1948-49, when it rose to 14.85 lakh maunds. This was the result of the directive to all salt sources to step up production so that the country would become self-sufficient in salt but the introduction of quality control has necessitated a revision of this policy. The manufacturing season is now restricted to the period October to April and the aim is to produce 10 lakh maunds of salt annually, out of which 5 lakh maunds would be standard salt.

(g) *Cost of Production*.—Prior to the British administration, the manufacturers were paid rupee one per hundred maunds. Three rates of 2, 2½ and 3 pies per maund were introduced by the British Government soon after taking over the source, i.e. about 1880. The cost of extraction and storage in the beginning hardly came to about 4 pies a maund. Gradually the rates had to be increased. The actual cost of manufacturing and storing salt at Didwana about 1892 was a trifle under 6 pies per maund. But if to this actual cost were added (1) the cost of the supervision establishment and (2) the amount chargeable for the rent of the source, the average cost between 1-4-1882 and 31-3-1893 amounted to 2 annas 9·32 pies per maund.

About 1918-19, the rates varied from 3 to 5 pies a maund, but the payment for storage was separate. The present rates for manufacture paid to the Deswals for the standard and sub-standard salts are 34 and 26 pies per maund respectively. As there are two Sections (Mata Section and Bore Section) storage charges are also paid at different rates depending on the distances. The present rates are:—

(1) For Mata Section 24 to 26 pies per maund.

(2) For Bore Section 21½ to 23 pies per maund.

These rates were fixed in January 1954. From 1927-28 the figures for this source are exhibited separately in the Commercial Accounts. Interest on capital and establishment charges being low and the major portion of the rent being debitable to 'protection', the source usually works at a profit.

(h) *System of Sales*.—A few treasuries such as Hissar, Rohtak, Bikaner and Sambhar are authorised to accept revenue for Didwana salt. Money is deposited there and indents are sent by the treasury officer to the Superintendent-in-charge. Salt is not despatched departmentally by rail but is delivered to traders at the heap. Traders make their own arrangements to carry it to the Balia railway station 1½ miles away. The wagon load unit is 295 maunds. Salt is removed on pack animals by Banjara pedlars. This is issued through a contractor who collects the revenue and pays it bi-weekly into the Didwana treasury and issues the salt to the Banjaras after weighment by the Inspector. The Banjara contractor is allowed to levy a fixed commission per maund on the quantities issued. The selling price at present is Re. -/8/- per maund plus Re. -/3/6 per maund as cess, the traders bearing all the charges for removal.

(i) *Issues and Distribution*.—The Issues and Distribution of Didwana salt since 1907-08 are shown in the table below:—

(In lakh maunds)

Year	Punjab	Uttar Pradesh	Rajasthan	Bihar	Total
1907-08	1·97	..	·94	..	2·91
1908-09	1·05	..	1·09	..	2·14
1909-10	1·77	·36	1·11	..	3·24
1910-11	2·10	·38	1·31	..	3·79
1911-12	2·32	·10	1·09	..	3·51
1912-13	2·62	·01	1·19	..	2·82
1913-14	2·38	..	1·02	..	3·40
1914-15	3·00	·02	1·59	..	4·61
1915-16	2·85	..	1·11	..	3·96

Year	Punjab	Uttar Pradesh	Rajasthan	Bihar	Total
1916-17	3.37	..	.97	..	4.34
1917-18	1.21	..	1.04	..	2.25
1918-19	1.52	.80	.33	..	1.87
1919-20	3.89	.71	.78	..	5.38
1920-21	1.15	.48	.86	..	2.49
1921-22	2.01	2.01	1.11	..	5.13
1922-23	3.99	3.39	1.27	..	8.65
1923-24 . . . . .	.76	.39	.54	..	1.69
1924-25	3.63	1.27	1.01	..	5.91
1925-26	1.15	.41	1.22	..	2.78
1926-27	2.06	.32	1.07	..	3.45
1927-28	2.05	.29	1.07	..	3.41
1928-29	1.55	.43	1.02	..	3.10
1929-30	1.16	1.28	0.89	..	3.33
1930-31	1.10	0.83	1.07	..	3.00
1931-32	1.14	0.92	1.13	..	3.09
1932-33	1.16	0.52	1.08	..	2.76
1933-34	1.56	0.63	1.24	..	3.43
1934-35	0.94	.09	1.31	..	2.34
1935-36	0.95	.26	1.22	..	2.43
1936-37	1.12	.30	1.42	..	2.84
1937-38	1.21	.35	1.35	..	2.91
1938-39	1.21	.36	1.32	..	2.89
1939-40	1.54	.51	1.50	..	3.55
1940-41	1.33	.54	1.49	.19	3.55
1941-42	1.17	.47	0.71	1.43	3.78
1942-43	1.10	1.85	0.81	2.27	6.03
1943-44	1.03	0.32	2.05	2.80	6.20
1944-45	0.89	0.24	1.91	2.94	5.98
1945-46	1.09	0.25	1.50	2.30	5.14
1946-47	0.88	0.24	1.66	4.91	7.69
1947-48	1.71	2.50	2.86	2.78	9.85
1948-49	3.09	4.33	1.78	0.39	9.59
1949-50	2.41	2.10	2.25	0.77	7.53
1950-51	2.03	3.09	1.9	7.11	14.13
1951-52	2.45	5.56	3.47	4.01	15.49
1952-53	2.62	3.33	2.32	0.01	8.28
1953-54	2.34	3.63	2.49	..	8.46
1954-55	1.59	2.67	.73	..	5.46*
1955-56	2.00	3.00	1.00	..	7.00 †

* Includes clearances for Pepsu, Delhi, Madhya Bharat, Nepal etc.

† Includes clearances for Delhi (1 lakh)

Formerly the nearest railway station to Didwana was Kuchaman Road (Nawa) at a distance of 40 miles from it. A considerable quantity of Didwana salt was conveyed by camels or bullock carts to Kuchaman Road and distributed from there by rail. Now-a-days this salt is distributed from Marwar Balia station. Since the introduction of quality control issues for human consumption purposes have dropped and it only goes to Hissar, Sikkar, Jhunjhunu, Bikaner, Churu and Ganga Nagar districts. For industrial purposes however a quota of 685 thousand maunds of salt has been allotted to this source and sub-standard salt is despatched to approved salt dealers in the various districts of Punjab, Pepsu, Delhi, Ajmer, Uttar Pradesh, Bihar and Rajasthan States.

(j) *Recovery of sodium sulphate at Didwana.*—As mentioned before the brine at Didwana contains a large percentage of sodium sulphate. Some of the sulphate has been gradually depositing on the pan beds and formed a hard crust. In 1940 when imports of sulphate ceased owing to war, attempts were made to locate sources of sulphate in India. The thick crust at the pan-beds at Didwana on analysis showed that it was practically pure sodium sulphate. Excavation of sodium sulphate from the pan-beds has since been going on. During the last 14-15 years about 30 lakh maunds of sodium sulphate have been excavated and supplied to paper mills, etc. Sodium sulphate is used in large quantities in the manufacture of glass and kraft paper. It is also used for making water-glass and in the dyeing and the textile industry. Considerable quantities of sodium sulphate are converted into bisulphate for use in the working of copper nickel ores as a fluxing agent. It is also used for preparation of sodium sulphide.

(k) *Future Possibilities.*—This source has great potentialities in respect of cheapness with which salt can be produced. It has also come into the lime-light owing to the discovery of sodium sulphate deposits here. The productive capacity of the source is far in excess of the trade demand and the annual out-turn of salt is generally limited to a quantity sufficient to meet the demand. A large quantity of salt produced is sub-standard and cannot be issued for human consumption. It is issued for industrial purposes only. Attempts are now-a-days being made to prepare standard quality salt by having condensers alongside the crystallising pans to eliminate sodium sulphate from brine in cold mornings. It is proposed to concentrate on manufacture of salt during winter months and thus produce better quality salt. Some of the recommendations made by the Salt Experts Committee are given below:—

- (i) A detailed study of the strata of the lake up to the basic rock should be carried out.
- (ii) The pans should be realigned to a standard size with a width not less than 40 feet and a length of 100 feet or above. Regular pathways should be provided to facilitate collection and removal of salt.
- (iii) The quality of salt produced is unfit for human consumption and to prevent it being sold for this purpose it should be cast into blocks and used as salt licks for cattle.
- (iv) A two feet gauge track within the works for transporting the salt from the pans to the storage yard should be provided to cheapen the cost of haulage.
- (v) The method of manufacture should be radically altered. Some of the crystallising pans near the wells should be converted into condensers and charged with brine from the end of October. As the evaporation progresses it should be replenished with

fresh brine and when it is saturated with respect to sodium chloride it should be transferred in the early hours of the day to the crystallisers. The brine in the crystallisers should not be allowed to rise above 28 to 29 Be. and the bitterns should be regularly eliminated in the hottest part of the day. In the winter months this procedure will yield edible salt and in the hot weather the salt obtained will be suitable only for making salt licks.

- (vi) The bitterns should be allowed to collect and dry up in a separate area until a method is evolved for the recovery of the by-products.
- (vii) Pumps worked by diesel engines should be installed to lift brine from the wells.
- (viii) The extraction of sodium sulphate should be carried out at a faster rate by use of air drills which will also help to cheapen the cost.
- (ix) Sodium sulphate be sold in bulk and bagging should be reduced to attract foreign buyers and to earn useful foreign exchange.
- (x) The application of the German process of electrolysis of sodium sulphate should be investigated for the production of sulphuric acid and caustic soda.

CHAPTER XII

SAURASHTRA AND KUTCH SALT SOURCES

Salt has been known to have been manufactured along the coast line in Kathiawar and Kutch and on the edges of the Rann of Kutch from times immemorial. This manufacture of salt has been carried on from two kinds of brine; (a) from the sub-soil brine taken out by digging wells in the Rann of Kutch (inland sources), and (b) by drawing brine direct from the sea or making small pits along the edges of the sea to tap this brine (marine sources). The history of this manufacture from the two kinds of brine and the development of such works till date have been dealt with separately in this chapter.

A.—INLAND SALT SOURCES

Kuda (Dhrangadhra State—now in Saurashtra)

(i) *Historical*—(a) *Prior and up to 1870.*—Kuda is the name of a small village lying on the southern fringe of the Little Rann of Kutch and is about 9 miles towards the north of Dhrangadhra town, which was lately the headquarters of the Dhrangadhra State and which now forms a Sub-division of the Zalwad District of the United States of Saurashtra, about 24 miles towards the west of the Government owned salt works at Kharaghoda, and is separated from them by the Rann itself. The geology of the Kuda brine deposits is exactly the same as that of the Kharaghoda brine deposits whose situation and geological formation have already been discussed under Kharaghoda Salt Sources in the Bombay Chapter. This Rann of Kutch, lying on the north of Kathiawar and north-east of Kutch State, has been exploited for the manufacture of salt from times immemorial and many smaller works used to function prior to the advent of British rule in India and their excise policy on salt, on its edges in Kathiawar and Kutch, the most important being the salt works of the Dhrangadhra State situated at Kuda.

The Rulers of Dhrangadhra State are known to have manufactured salt for centuries at Kuda, i.e. ever since their rule was first established in North Gujerat in the 12th century. Previous to and during the rule of the earlier Sultans of Gujerat, Virangam, Patdi, Mandal, etc., the territories bordering on the Lesser Rann of Kutch were in the possession of the Jhala Rulers in whose hands was the entire manufacture of salt within this area. When the Jhala Rulers retired to their new capital at Halvad, they set up their salt works at Kuda and other places on the Rann and these were specifically granted to them by a *Firman* by the Emperor Aurangzeb in the 24th year of his Rule and were confirmed by an Imperial *Firman* of the 27th year of his reign (A. D. 1669-1670). This *Firman* is still in the Dhrangadhra State archives, and a copy of a certified translation of the same has been given as an Appendix as it established the hereditary rights of the Rulers of Dhrangadhra to manufacture salt at Kuda.

This *Firman* recites, *inter alia*, that the District of Mahmadnagar or Halvad together with the salt pits was entirely assigned in accordance with the Sanads of former rulers in Jagir to the ancestors of the Zamindar Rajput Jhala (namely) Jaswantsing (and his descendants) generation after generation without fear of obstruction on the part of any person and without the imposition of any condition or conditions and without partnership with any other person.

This right to manufacture salt at Kuda continued unimpaired through the many changes in Governments in Gujerat and Kathiawar, and the successive Governments, first of the Moghuls and later of the Maharattas, had no further concern with the Province of Kathiawar except the collection of the periodical tributes, beyond the payment of which the Kathiawar Chiefs were entirely independent. This is also clear from the reports of Colonel Walker, who demarcated the Province in 1807-08, and the British Government at that time guaranteed full rights to this State to continue to manufacture salt, and it was also proclaimed that no encroachment on this right was contemplated. This guarantee was constantly respected by the later authorities and was further confirmed by the Proclamation of Her Majesty the Queen Empress in 1858. Thus, history records that up to the year 1870 there was no interference with this right of this State to manufacture salt at Kuda. Up till this time Badagara salt which was considered as the best of its kind was manufactured at this source and the nature of crystals of this salt is described in the *Mirat-i-Ahmadi*, which said that the salt crystals resembled pieces of sugar. This salt, in addition to meeting the local requirements of the adjacent territories, was known to have obtained markets in the far off places like Mewar, Marwar and Malwa. This has been testified by Colonel Watson (once Political Agent in Kathiawar) who, in his book "Statistical Account of Dhrangadhra", has recorded as follows:—

"The trade of the Dhrangadhra State originally consisted principally in exporting stone, salt and grain to Mewar, Marwar and Malwa. Owing, however, to the famine of A. D. 1813-14 and death of many of the pack bullocks, the salt trade and the important trade of dyes and other miscellaneous articles which were imported from those countries received a severe check. Trade did not revive until about A. D. 1843-44, when, owing to the increase in the cultivated area generally, a large export trade of grain, cotton and *ghi* gradually sprang up and salt began to take its place among the exports.

This salt has always been of superior quality and is called Wadagara or of the great Agar or salt pan in contradistinction to the natural salt or salt such as is made further westward in the Nawanagar territory. The crystals of Wadagara salt much resemble white sugar-candy, and the *Mirat-i-Ahmadi* specially notices Jhinjhuwara salt, which it says, resembles pieces of sugar and is exported to Malwa and elsewhere. When the Jhala Chiefs retired to Halvad they set up a Salt Works at Kuda; this Salt Works (Nimaksar) is specially mentioned in all the grants of the time and is confirmed to Jaswantsingji by the Imperial grant of the 24th year of Aurangzeb's reign."

This conclusively proves that before and during the 19th century, Kuda salt industry was quite flourishing and the salt produced here had established markets at far off places in western and north-western parts of India.

(b) *From 1870 to 1900.*—This industry and the State's hereditary rights continued uninterrupted till 1870, when, as a result of the recommendations of Mr. W. G. Peddar, of whom mention has already been made, the Government of India and the Bombay Government orientated an entirely new Excise policy towards the production and distribution of

salt with a view to safeguard the salt revenue interests of the British India Government. His recommendations, among others, as affecting Kuda Works were:—

- (i) Amalgamation of all the scattered salt works in the Rann of Kutch into one or two large salt works near Kharaghoda for the supply of Baragara salt, and
- (ii) Keeping and strengthening the guard establishments on the Frontiers (both land and sea) to check smuggling of salt from foreign territories like Kathiawar and Kutch etc.

This policy ultimately resulted in the starting of the Government salt works at Kharaghoda on a monopolistic basis where production of salt was proposed to be concentrated and resulted, as designed, in curtailing the salt manufacturing activities of the States of Kathiawar and particularly of Dhrangadhra State, which was situated in the close proximity of the Kharaghoda Salt Works; and under political pressure, an Agreement was signed in the year 1880 between the Dhrangadhra State and the British Government, which restricted the State to produce annually only 90,000 maunds of salt. This quantity was intended to meet the local requirements only and its export to the British Indian markets was prohibited. This quantity was further reduced to 40,000 maunds by an Agreement of 1883, and finally the Agreement of 1900 totally prohibited this State from manufacturing Baragara salt in its territories, and a small compensation of Rs. 7,000 a year was fixed to be paid to the State. During this period (1870-1900) the salt industry in the States of Kathiawar and Kutch in general and in Dhrangadhra (Kuda) in particular, had to face very violent restrictions, as these States were outside the territorial jurisdiction of British India. The revised Salt Act VII of 1873 was passed, and this was subsequently supplanted by Act II of 1890.

With a view to prevent the smuggling of non-duty-paid salt from the States of Kathiawar and Kutch into British India, the Frontier Salt Preventive Line was established in December, 1875 under orders of the Governor-in-Council *vide* Notification No. 44 of 1875 of the Kathiawar Political Agency. The definition of this "Frontier Line South of Radhanpur" was as follows:—

"From the Rann opposite Radhanpur Territory the Line is to follow a course parallel to the coast of the Rann, and at a distance of 3 miles therefrom, until it reaches the cart track leading from Sultanpur to Udoo. From this point it will proceed straight to the westernmost masonry Pillar of the Patri Bajana boundary; thence it will run due east until it reaches the boundary of the Viramgam Taluka opposite the village of Gorla, leaving on its north the village sites of Saulas, Salla and Uparialla in the Bajana Taluka; it will thence follow the boundary between the British Territory and Kathiawar, until, after encircling the Dhanduka Pargana, it reaches the gulf of Cambay at the Sundrai creek."

And the same was extended in 1882 for "North of Frontier of Jhinjhura in Kathiawar" and was defined as:—

"From the Northern Extremity of the Frontier Preventive Line as defined by Notification No. 44 of 1875 of the Political Agent in Kathiawar the line will follow a northerly course parallel with the Coast of the Rann and at a distance of three miles therefrom until it arrives opposite the boundary between Mowsari, a Wao village under the Palanpur Political Superintendency and Boyetra under Jodhpur in Rajputana."

In accordance with these orders, all salt not duly covered by a permit, which was carried across this Frontier Line by a route other than prescribed by the Governor-in-Council for the purpose, and all salt spontaneously produced within the East of this Frontier Line and removed without due permission, was defined as contraband salt under the Bombay Act VII of 1873; and all persons concerned in passing, removing or transporting such salt, or accepting or retaining such salt, and all such salt and all vessels, animals, and conveyances used or intended to be used in transporting it, and all goods, packages and coverings in or among which it may be placed, were made liable to the penalties set forth in part 6 of the said Act. And also all salt stored within 10 miles of the said Frontier Line in excess of the quantity *bona fide* required for local consumption was, from the date of this Order, declared to be contraband and liable to confiscation, together with all goods, coverings and packages among or in which it may be placed. Preventive Officers of the Bombay Salt Department were posted all along this Line and definite Rules of procedure were laid down by the Government for the maintenance of the Preventive Line in Kathiawar and the assistance of the local Chiefs was invoked for a successful working of this Line. The Chiefs were required to give full assistance to the Government Salt Department Officers for their accommodation in villages in their territories and in the discharge of their preventive duties, like apprehension of smugglers and seizure of suspected salt with its containers and conveyances, etc. The storage of salt in excess of quantities required for local consumption in villages within 10 miles of the Preventive Line was strictly forbidden. For such duties, the officers of the Salt Department were to be afforded free access to the suspected places in the villages in Kathiawar and were entitled to respect and assistance. However, in July, 1884, *vide* Political Agency Notification No. 32 certain arrangements were made for the storage and distribution of salt in Kathiawar along the British Frontier Line. According to these Rules, Depots for storage and sale of salt were permitted to be maintained within the ten miles belt and vendors were licensed in all villages for this purpose, and the villages, where no vendors could be licensed, were permitted to obtain their requirements of salt from licensed hawkers. The quantities of salt to be stocked with the licensees were restricted to two months' requirements depending upon the population to be served, excepting during monsoons when four months' requirements could be stored. The licensed vendors were to obtain their supplies on permits from the Depots, which numbered 14 in all to begin with in this belt. Any violations of these Rules were made punishable in the spirit of the Bombay Salt Act.

Some of the inland States, including Dhrangadhra State, were further directed in April, 1875 to take such steps as to ensure that no untaxed foreign salt passed from any place in Kathiawar into British India or into any other part of India and to make necessary Rules to stop any such traffic.

Further, with a view to prevent any illicit landing by sea of non-duty-paid salt from Kathiawar and other foreign territories along the West Coast of British India, North of Cochin, The Transport of Salt Act XVI of 1879 was enacted, but this was essentially a preventive measure to ban the smuggling of non-duty-paid salt from the maritime States of Kathiawar and did not affect any more the salt works at Kuda.

(c) From 1900-1922.—From the year 1900 onwards as recorded above, the manufacture of Baragara salt at Kuda being totally abandoned, the production of inferior quality *Ghasia* salt was permitted only to meet

the local requirements of the Dhrangadhra State. Thus, the Kuda Salt Works had to be practically abandoned with a view to concentrate on the production of Baragara salt at Kharaghoda under British Government's control, and the whole of Gujerat was intended to be supplied with salt produced at this centre. These salt works were opened between 1875-1881 and named as "Pritchard Salt Works" after the name of Sir Charles Pritchard, the first Collector of Salt Revenue, Bombay. The experienced agarias (salt workers) who had worked at Kuda for generations together were shifted to work in the new Government Salt Works.

In 1915, the Dhrangadhra State approached the British Government for a revision of the Treaty of 1900 with a view to encourage the manufacture of magnesium chloride, a by-product recoverable from the bitters left over in the salt works after the production of salt, for which an emergent demand had been created due to the commencement of the 1st World War. Magnesium chloride, as was strongly represented by the State, got in extremely short supplies due to the imports from Germany having stopped, and its prices shot up suddenly. This chemical was essentially required by the textile industry at Ahmedabad, Bombay and other places for preparation of sizing for cotton yarn, where it is used on account of its hygroscopic properties to keep the yarn moist, soft and pliable. This was, however, allowed by the British Government, subject to the condition that no Baragara salt was to be manufactured and the bitters obtained from the manufacture of Ghasia salt were to be utilized for the production of this by-product. Soon after an Agreement between the State and Seth Naginla Maganlal of Ahmedabad was made providing for the recovery of this by-product, and a new concern "Dhrangadhra Magnesium Works" was started. The annual production of this Works was about 1,000 tons and it could not be increased because of the limited quantity of bitters being available from the Salt Works. The Magnesium Works had, however, to be closed down soon after the War, owing to the import of magnesium chloride from foreign countries, particularly from Germany at much cheaper cost, and the indigenous industry could not compete. The State, however, continued to press for its claims to manufacture Baragara salt at Kuda, and in the meanwhile in 1919-20 approached Mr. Kapilram H. Vakil, a reputed consulting chemist and chemical engineer of Bombay, to undertake research work with a view to submit a report on the possibilities of manufacturing various by-products from the mother liquor remaining after the recovery of salt from the brine at Kuda. Mr. Vakil, after intensive research and study, submitted his valuable report to the State, which was published in 1924 in the form of a book entitled "Salt", containing the theory and practice of salt industry and the recovery of by-products. This book contains details of the technology of salt manufacture, and the different processes and stages involved in this industry have been explained.

(d) From 1922-1932.—It was not until 1922-23 that the Government of India restored to the State its right to manufacture both Baragara and Ghasia salts after detailed deliberations, *vide* Order No. P/51 of the 18th December, 1922 of the Agent to the Governor, Kathiawar, Rajkot, and a new Agreement was made. And, on the 30th October, 1923 the Governor of Bombay, Sir George Lloyd, formally performed the opening ceremony of the Kuda Salt Works, and since then these works are known as "The Sir George Lloyd Salt Works, Kuda". In this Agreement of 1922-23, whereas the State was given full freedom to manufacture unlimited quantity of salt to be wholly converted into chemical products, the quantity of Baragara salt to be produced during the first five years was limited to five

lakh maunds annually, and this was to be purchased and distributed in the British India markets through the Government % Salt Department. The Dhrangadhra State also agreed to the cessation of the annual payment of Rs. 7,000 as agreed to in 1900, and this was stopped in 1924 when this new Agreement came into force. This quantity of five lakh maunds was to be bought every year by the Government of India for the first five years at a fixed price of three and a half annas per maund, and the quantity to be purchased after the lapse of the first five years was to be determined later on by the Government in accordance with their requirements. In addition, the State was also permitted to manufacture 50,000 maunds of salt annually for consumption within the State. This Agreement was hailed by the Dhrangadhra State which, after a lapse of about half a century, was permitted to resume its production activities at Kuda in 1924, though in a very restricted way, and this, therefore, marked the beginning of the revival of the ancient Industry in the State. Officers of the Bombay Salt Department from Kharaghoda Government Salt sources were posted at Kuda in connection with the purchase and disposal of salt meant for British Indian markets and the price, duty and other charges had to be deposited in advance as in the case of Kharaghoda salt. The more important provisions of this Agreement governed—(a) the production and disposal of salt produced, (b) purchase by the Government of India for distribution in British India, and (c) inspection, labour and production and disposal of by-products. No Baragra salt could be manufactured that could not be disposed of either by sale in Kathiawar (estimated consumption about 50,000 maunds) or by placing any reserve heap to be maintained by the Dhrangadhra State for its Kathiawar sales. Government of India first agreed to buy 5 lakh maunds of salt every year for 5 years at As. 0-3-6 per maund. Any quantity produced over and above was to be only for purposes of by-products. As regards sales in Kathiawar, the State undertook to sell at a price not less than the price at which salt was sold at Kharaghoda. The State also agreed not to sell Kuda salt in the Dhanduka Taluka. As regards the salt to be purchased by the Government of India, it was to be inspected by the Superintendent of Salt and Excise, Kharaghoda before despatch and the salt was to remain under the control of a staff paid by the Government of India. As regards the inspection, the Superintendent of Salt and Excise, Kharaghoda and the Deputy Commissioner of Salt and Excise, Northern Division had to be authorised by the State to inspect at any time all salt works and all books, accounts, etc., relating to Baragara salt. The State also undertook not to apply the compulsion of any kind to force Agarias to work in the State works if they wanted to work at Kharaghoda. The Agaria labour at the two works was to be distributed by the British and the State authorities in consultation with each other. The by-products could be exported by the State to foreign countries and could also be sent to British India after charging prevailing excise duty.

A couple of months later, on the 16th January, 1924, the foundation stone of the Works and the town at Kuda was laid by His Highness the Maharaja of Dhrangadhra State, and the Works and the town were named "Nimaknagar" (i.e. Salt villa or Salt town). This new site, a mile each north to south and west to east, was selected about a mile and a half to the south of the old site (at Kuda) to avoid certain inherent disadvantages from which the old site suffered, like the nature of the beds and its accessibility to floods during monsoons and absence of any natural and useful contour levels. The southern half of the new site, which is slightly higher in levels, was laid out for residential purposes and in the northern half the Works proper were constructed. The changed site has given very useful natu

contours giving a drop of about 2' from south to north and 2' from west to east, and these natural gradients have helped considerably in the economical layout of the Works. Necessary provisions were made for the collection of mother liquor or bitterns by gravity flow without any wastage or undue handling and the Works were designed to be constructed in a scientific way, making full use of the experience gained by centuries of working at Kuda and Kharaghoda. The directions of the crystallising pans were arranged in such a way as to avoid completely the danger of the sand storms, which blow furiously during May and June every year in this part of the Rann, spoiling the quality of the salt produced in the Works. The pans were constructed in the north-east of cotton fields and agricultural lands whereby the south-westerly sandstorms could little damage the crystals produced in these pans.

The new Works having been opened in January, 1924 the construction of the same was taken in hand in right earnest and about seven lakh maunds of salt was manufactured during the very first year from both the old and new salt works, working 200 pans in all. The annual production varied between four to six lakh maunds and continued till the season of 1932-33. Under the terms of the Agreement, the Government were to purchase five lakh maunds of salt every year, and this disposal was started from 1927 onwards, and, as the crop of the second year, i.e. of 1924, was found rather bad in quality and could not be disposed of, the other crops were taken up for distribution. As the rate of production was more than the sales, stocks started accumulating, and production was reduced to between one and two lakh maunds from 1933 season onwards, and the Government continued its purchase of salt under the Agreement at the rate of about four to five lakh maunds a year. This purchase was actually started from the crop of 1923 and continued for five years till 1927, the actual despatch to the consuming areas was started in 1927 and the whole stock was finished by July, 1932. The following sale price per maund was fixed for the Kuda salt in 1927 and a wagon-load of 270 maunds unit was fixed against 450 maunds unit of Kharaghoda which is on the broad-gauge:

	Rs. as. ps.		
Duty	1	4	0
Cost price	0	3	6
Sewing charges	0	0	4
	<hr/>		
	1	7	10
Bagging, etc.	0	3	2
	<hr/>		
	1	11	0
	<hr/>		
			Without bags
			With bags

This stock from Kuda was meant to be distributed for the metre-gauge destinations both within and outside the Presidency of Bombay, and the indents were accepted by the Manager, Main Salt Stores, Kharaghoda, as was being done for Kharaghoda salt. Government were able to dispose of the salt purchased from Kuda by 1931-32, when they ceased to purchase any more salt from the State, and the officers posted for the purpose from the Kharaghoda Salt Works were withdrawn.

During this period, at the continued requests of the State, the Government permitted in 1924 the export of Baragara salt produced at Kuda by sea to places outside India, via one of the ports in Kathiawar, and after

a lapse of two more years, the State was further permitted to export Baragara salt by sea to Calcutta and Rangoon. Certain rules were framed soon after to regulate the production of Baragara salt at Kuda and its disposal for local use for alimentary and industrial purposes and for export by sea to places outside India and to Calcutta and Rangoon. All these were incorporated in another Agreement executed in March, 1931. The following were the main articles of this new Agreement:—

“Salt manufactured at Kuda was to be disposed of in one of the following four ways:—

(a) *Sold in Kathiawar.*—(i) This quantity was not to exceed 50,000 maunds a year without the permission of the Government of India, who retained the authority to permit greater sale of salt in case the local consumption in Kathiawar justified it. The excess quantity was to be drawn from the reserve heaps maintained for the purpose by the State.

(ii) The salt was not to be sold at a price less than the price including the full salt duty for the time being in force at which salt was being sold at Kharaghoda.

(iii) This salt was not to be sold in Dhanduka Taluka.

(b) *Placed in reserve heap to be maintained by the State at Kuda.*—

(i) This reserve heap was not to exceed at any time 50,000 maunds without the sanction of the Government.

(ii) The reserve stock was to be drawn upon only if manufacture failed in any one year and there was no new salt ready for issue to Kathiawar, or if the increased demand in Kathiawar demanded it.

(iii) The State was to take all necessary precautions to prevent leakage of salt both from their works and reserve heaps.

(c) *Exported by sea via Kathiawar ports to ports outside British India and to ports in Bengal and Burma.*—These exports were permitted on more or less similar terms which governed the export of salt from other maritime States in Kathiawar and Kutch to ports outside India and to ports in Bengal and Burma. These terms will be discussed under the history and development of the salt industry in the maritime States in Kathiawar.

(d) *Transformed into by-products.*—Any additional quantity of salt which was to be produced in a continuous process of manufacture was to be wholly transformed into by-products.”

However, it should be mentioned that the State was not able to avail itself of the permission granted to it for export by sea via Kathiawar ports to ports outside British India and to ports in Bengal and Burma, since it was not a maritime State, and the nearest port to it was at Bhavnagar situated at a distance of about 141 miles. Otherwise too, it was doubtful if the Baragara salt could have possibly found any market in Calcutta or Rangoon, which were used to fine sea salt being imported from Middle East countries. As such, in practice this revised Agreement of 1931 did not afford any incentive to this industry at Kuda, and the State had once again to reduce its production activities. The Government of India was not to purchase any more salt as had been originally agreed in the Agreement of 1922-23.

(e) *From 1932-41.*—The State, however, continued to approach the Government of India for permission to export salt to markets in British India, along with Kharaghoda salt, and the Government of India ultimately conceded the right to rail Kuda salt to Nepal and certain districts of Bihar

and Orissa, which normally drew their supplies from abroad *via* Calcutta, but declined to permit its export to British India in general, and the following four reasons were advanced in support of their refusal:—

- (i) That the Government works at Kharaghoda having been in existence long before the Dhrangadhra State took to manufacturing salt, the State could not claim for their own manufacture,
- (ii) That Government agreed to Dhrangadhra increasing the output of salt under a misapprehension that the manufacture of salt was necessary for the development of the State's chemical industry,
- (iii) That the salt revenues of the Government of India would be seriously affected if the permission asked for was granted, and
- (iv) Lastly, that if Dhrangadhra salt was allowed to be imported into the then United Provinces it would open up possibilities of competition with Northern India salt.

The State, again in 1936, represented its case to the Government and challenged the validity of the four reasons advanced by them while refusing permission for export of salt by rail to British India in general. This was, however, not conceded to by the Government in view of the salt revenue interests, and the State was left to export its salt by rail to Nepal, and certain districts of Bihar and Orissa, as permitted earlier.

The absence of any assured market for the salt forced the State to reduce its activities and the production of salt at Kuda, which had varied between four to six lakh maunds a year from 1924 to 1932, suddenly came down to between one to two and a half lakh maunds from 1933 to 1941. The salt industry at Kuda, therefore, continued to drift for about eight years till 1941.

It may be stated that as a result of the researches carried out by Mr. Kapilram H. Vakil at the instance of the Dhrangadhra State, as referred to earlier, the "Shakti Alkali Works" came into being in the year 1925-26, with a view to manufacture Soda Ash from the salt produced at the State Salt Works at Kuda. The word "Shakti" was after the name of the goddess "Shakti" of the Dhrangadhra State. These chemical works were designed and installed under the personal supervision of Mr. Vakil, and continued to function till about 1934, when they ceased to work. During this period, the chemical works obtained their supplies of salt from the Kuda Salt Works. In 1939, after a lapse of about five years, the Shakti Alkali Works were sold by the State to The Dhrangadhra Chemical Works, Ltd., a public limited company, under which name they continue to function till date. In January, 1939, an Agreement was made for this sale and the Dhrangadhra Chemical Works, Ltd. also obtained the perpetual right to manufacture salt at Kuda and the following are some of the important terms of the Agreement as they related to the production of salt at Kuda and its disposal:—

- (i) The salt lying in stock at Kuda was sold to the company at prices to be agreed upon mutually,
- (ii) The company obtained the sole and exclusive manufacturing right so long as it existed to manufacture salt at Kuda salt works without having to pay any royalty to the State subject to the condition that all rules and regulations governing the manufacture and distribution of salt as may be laid down by the Government of India from time to time were to be complied with,

- (iii) The company was to have exclusive right for the sale of this salt in British India and/or in any of the Indian States if so allowed by the Government of India in due course and was to derive all benefits from such sales,
- (iv) The Company agreed to pay on all sales made outside Dhrangadhra State royalty at the rate of 25% of the net profit realised by the company subject to a maximum royalty of three pies per maund,
- (v) The State leased the existing salt works with all lands, bungalows, tenements, railway lines, rolling stock, machinery and implements, etc. relating to the same at a nominal rent of Rs. 451 per annum.

(f) *From 1941 to March, 1947.*—Soon after from 1940, the Dhrangadhra Chemical Works, Ltd. started functioning and, at the same time, due to the outbreak of World War II in September 1939, an emergent demand for salt was created in North and North-Eastern India due to the reduction in the shipping of salt into Calcutta from foreign countries. At this stage, the works were encouraged to extend their activities and, whereas only 25 pans were used for salt manufacture in 1941, the number was increased to 225 in the very next year, *i.e.* in 1942, and the production thereby was increased to 13,52,000 B. maunds, against only 1,62,000 B. mds. of the previous year. And, in this year (1942) the Works also used about 8½ lakh maunds of salt for manufacturing Soda Ash in their own Chemical Works at Dhrangadhra. At this time, with a view to stabilise the rising prices of salt in British India, the Government of India made an Agreement with the Works for the purchase of salt for distribution along with the Khara-goda salt in the British Indian markets. This Agreement continued for three years, *i.e.* 1942-43, 1943-44 and 1944-45, and no salt was purchased in 1945-46. Again in 1946-47 salt was purchased by the Government for distribution on their own account. During this period the production also increased steadily and, in 1945, 301 pans were worked. The same, however, showed a decline in the next two years, as the Works had not received any offers of purchase from the Government. The production during the years ranged between 12·68 and 18 lakh maunds. Out of this production the Dhrangadhra Chemical Works consumed about 7 lakh maunds and a quantity ranging from 3 to 6·5 lakh maunds was purchased by Government. The price paid was Rs. 6-6-0 per ton, except in 1946-47 when it was Rs. 9-5-7 per ton.

Along with this purchase of salt by Government from 1942-43 and its own consumption in the Chemical Works, the scarcity conditions created in the supply of salt in Nepal, Bihar and Orissa, which areas are normally fed through Calcutta by imported foreign salt, helped the State to dispose of appreciable quantities of salt to these markets, since it had already been permitted by the Government, as early as 1936, to send its salt by rail to these areas. In 1941 the State had also been permitted to send salt by rail to Calcutta and in 1942 they were further permitted to rail it to certain fixed destinations in West and North Bengal and in South Bihar. In 1942-43 the State purchased the surplus salt from the salt works and auctioned it to the local merchants for export by rail to permissible destinations under the rules which had been framed for this purpose by the Government of India. The works sold to the State about 50,000 maunds of salt at Rs. 4-9-2 per ton in 1942-43 and this figure rose to about 12,00,000 maunds in 1947-48 and the price to Rs. 17 per ton.

Elaborate rules were framed in 1936 by the Government of India with a view to safeguard their salt revenue interests, and were to be observed by the Dhrangadhra State in connection with the export of salt by rail from Dhrangadhra to Nepal through British India.

Among other things the rules provided that the exporter should deposit cash or Government securities sufficient to cover an amount exceeding by 10 per cent the duty leviable on the salt at British Indian rates. He was required to bag the salt in gunny bags and seal each bag. The exporter had also to arrange the invoice to be presented to the Customs Manager at Viramgam when the wagons arrived there. The Customs Manager could apply check weightment to the bags if he considered necessary. If he was satisfied he would allow the consignment to proceed. The salt on arrival at Kathmandu was to be checked by a responsible officer deputed by His Majesty's Minister. The security deposit was then released.

(g) *From April, 1947 to date.*—With the abolition of excise duty on salt from 1st April, 1947 and the termination of the British Rule in India from 15th August, 1947, this ancient industry in Saurashtra State saw a sudden change for the better after years of suppression and chequered career, and the production of Sir George Lloyd Salt Works, Nimaknagar shot up by about 50% in the very next year after 1946-47. The Frontier Salt Preventive Line established in 1875 was withdrawn and the various restrictions imposed on the production and movement of salt produced in the then Indian States were soon terminated with the radical change in the policy of the Government that abolished excise duty on salt. The Central Government took over the Salt Administration in Saurashtra State with effect from 1st April 1950 from which day the Central Excise and Salt Act, 1944 was made applicable to the State, as a sequence of the Federal Financial Integration of Parts B and C States. All the States in Kathiawar were merged with Saurashtra State from 1st April 1948. Soon followed a sudden development of this important industry and the production showed a steady increase as will be seen from the following table. These figures include the production obtained at two other salt works sanctioned in 1948 and 11 salt works which came into being in 1953:

Year	No. of pans worked	Quantity produced (‘000 B. mds.)	Quantity issued (‘000 B. mds.)
1946	..	15,08	*11,90
1947	192	12,68	22,50
1948	319	15,79	19,54
1949	329	18,92	4,74
1950	409	23,65	24,14
1951	461	29,33	32,74
1952	515	43,76	32,58
1953	910	71,91	41,18
1954	380	28,47	30,79
1955	417	32,79	48,14

*Inclusive of issues for chemical purposes.

The layout of these inland salt works has been discussed later.

(ii) *Climate, process of production, quality, etc.*—As stated earlier, Kuda is situated on the edges of the Little Rann of Kutch, about 25 miles towards the west of Kharaghoda salt sources, and the climatic conditions obtained at Kuda and other inland sources are practically the same as are obtained at Kharaghoda and the system of manufacture of salt here is also exactly the same as is followed at Kharaghoda, except some minor differences in the depth at which brine is available in the Rann and the densities of the sub-soil brine.

The quality of salt produced is the well-known Baragara type, as is being produced at Kharaghoda, and the maximum and average chemical compositions on dry basis are given below:

	Max. Purity %	Average Purity %
Sodium chloride	97.88	96.00
Calcium sulphate	1.53	1.37
Magnesium sulphate	0.03	0.56
Magnesium chloride	0.21	1.48
Insolubles	0.29	0.19
Undetermined	0.06	0.40
TOTAL	100.00	100.00

The chemical composition of the sub-soil brine is also practically the same as obtained at Kharaghoda sub-stratum.

(iii) *Cost of Production.*—The cost of production of Baragara salt at Kuda during 1948-49, as furnished by the Sir George Lloyd Salt Works, Kuda which are the premier works here, is as follows:—

	Cost per ton Rs. as. ps.
(a) Cost of obtaining brine into reservoirs and labour	10 5 11
(b) Power and fuel, maintenance (including betterment and repairs).	0 0 6
(c) Supervision, rents, rates and taxes	2 2 10
(d) Depreciation	0 2 9
(e) Miscellaneous charges	0 6 4
TOTAL	13 2 4

(Or Re. 0-7-9 per md.)

This excludes interest on capital, overheads and the usual monsoon washing, and continues to be practically the same. These prices have shown a steady increase from 1941-42, when the same were about Rs. 2-9-0 per ton.

(iv) *System of Distribution.*—The Rule of Dhrangadhra State ceased to exist from the beginning of 1948, when this State was integrated, along with all other States of Kathiawar, in the United States of Saurashtra, and the Saurashtra Government being the successor, continued to purchase this salt from the Dhrangadhra Chemical Works, Ltd. at a fixed price of Re. 0-10-6 per B. Md. for sale to merchants for ultimate disposal to the permissible areas in India. This system was, however, stopped in the beginning of 1949, when, in accordance with the Agreement (formally executed later in January, 1950), the Dhrangadhra Chemical Works, Ltd. were to sell salt surplus to their own requirements of the Chemical Works to certain merchants of Dhrangadhra who had formed themselves into "The Dhrangadhra Salt Merchants' Association", at prices to be fixed by the Saurashtra Government. This Association continued to handle the surplus salt till 1953 and the same was despatched to the zonal areas at prices fixed by the Saurashtra Government. The other manufacturers also despatched their salt side by side. This Association was purely an advisory body without any financial liabilities, and consisted of 18 members, all approved by the Saurashtra Government. The total quantity to be moved on behalf of the Association was distributed among its members in accordance with the shares held by each, and the Central Government was not concerned with it. Towards the end of 1953, "The Saurashtra Inland Salt Manufacturers' Association" was formed at Dhrangadhra and all the inland manufacturers joined it except a couple of them. The distribution was centralised at fixed rates on f.o.r. basis.

During the middle of 1948, Government of India decided to introduce the Zonal scheme for the distribution of salt on an all-India basis and salt produced at Kuda and other inland sources on the edges of the Rann in Saurashtra was also taken into consideration for distribution under this Scheme. The salt produced at the Maliya Salt Works, Maliya, was also included for despatch under this Scheme as, though these works used sea brine for manufacture of salt, yet had no facilities for its disposal by sea. This Scheme finally came into force with effect from 1st January, 1949, and under it a separate Dhrangadhra zone for supply of salt was created and a definite zone was fixed for it and at the instance of the Salt Commissioner, the Ministry of Railways (Railway Board) undertook responsibility for the supply of wagons for this movement under "Preferential Traffic". This naturally meant a great stability for these inland salt works, and they continue to develop since then. The zones of supply are slightly modified, if considered necessary, every year in consultation with the Railway Board and the States concerned, keeping in view the interests of the consumers and the manufacturers. The Dhrangadhra zone under the Zonal scheme consists of Kuda, Jesda, Maliya, Vanasar, Halvad and other inland licensed salt works in Saurashtra. This zone supplies salt to Bombay, Madhya Pradesh, Uttar Pradesh, Madhya Bharat, Saurashtra, Rajasthan, South and North Bihar and Nepal. The quantity allotted to these areas from this zone in terms of wagons and maunds is given below:—

Serial number	Name of the State	Quantity allotted per annum (in thousand maunds)	Allotment of wagons per annum
1.	North Bihar	500	1,695
2.	South Bihar	100	338

Serial number	Name of the State	Quantity allotted per annum (in thousand maunds)	Allotment of wagons per annum
3.	Bombay	100	338
4.	Madhya Pradesh	150	508
5.	Uttar Pradesh	1,280	4,344
6.	Madhya Bharat	700	2,373
7.	Saurashtra	50 800*	170 †
8.	Rajasthan	40	135
9.	Nepal	600	2,034
		3,520 800 *	11,935 †
		4,320	

NOTE:—* Industrial use.

† No wagons provided.

Experience has, however, shown that usually about 75% of these quotas are removed due to shortage of wagon supplies and lack of firm demands from certain areas.

In the middle of 1953, the Railway permitted the movement of salt under "ordinary traffic" outside the zonal areas after the demands under "preferential traffic" were fully satisfied. During 1953, this movement amounted to about 10% of the total movement.

All the State Governments concerned, with the exception of Bombay State, had till 1952, introduced "nominee" system in their States for supply and distribution of salt under their respective Salt Control Orders and salt was despatched to only nominees nominated by the local State authorities in accordance with the quotas fixed for each. But from 1952 to 1954 all the States concerned, permitted imports by other dealers too. The U. P. Govt. has also posted an officer at Dhrangadhra to supervise such movements. All inland salt works of Dhrangadhra zone can obtain orders from these nominees and other dealers and the payments of prices etc. are entirely left to their private arrangements.

(v) *Prices*.—The issue price is fixed by the Saurashtra Government and the total price including cess, commission of agents, sewing and bagging charges worked out in 1950 to Rs. 1-4-6 per maund and in 1952 to Rs. 1-1-8 per maund. The present price is Rs. 1-1-6 per maund since 1953 f.o.r. loading stations.

(vi) *Recent Developments*.—*Salt Experts Committee's Recommendations*.—The Salt Experts Committee appointed in 1948 by the Central Government observed that the potential capacity of the Kuda Works was 21,98,000 maunds and their forecast of production for 1955-56 was 24,50,000 maunds. The following were the Committee's main recommendations regarding the works:—

(1) Greater care and attention should be bestowed on the construction and maintenance of channels in order to reduce loss of brine by percolation and leakage.

(2) Topographical and hydrographical survey, together with geological investigations, of the entire Kuda area should be undertaken for locating sources of subterranean brine.

(3) The present type of wells should be replaced by tube wells in stages over a period of 15 years and should be sunk in the brine horizon 150' apart in groups of 16 wells each.

(4) The brine should be lifted by mobile pumps driven by electricity.

(5) The area of a reservoir should be 9,600 sq. ft. and of a crystalliser 20,000 sq. ft.—the reservoir needs to be of nearly half the area of the crystallisers.

(6) The quality of Kuda salt can be considerably improved by mechanical washing and these tests should be carried out in some laboratory to determine the improvement in quality as also the effect, if any, on the size of the crystals.

(7) Since the production of Baragara type is costlier than of the ordinary Kurkutch type, the works should make experiments for the production of Kurkutch type to determine the economy that can be effected by a change-over to this process.

(8) For use in any chemical industry where grinding and/or dissolution of salt crystals may actually involve further processing and additional expenditure, the production of Baragara type is not necessary, and ordinary type of Kurkutch salt as manufactured in marine salt works should be produced.

(9) The question of rail transport facilities as available at Kuda should be examined before any more salt works are sanctioned in this area. If, however, any more salt works are sanctioned, the new salt works should be designed to produce Kurkutch salt as its cost of production would be lower than that of Baragara.

(10) The cost of production of salt at Kuda is considerably higher than at Kharaghoda and, since the processes involved are entirely the same at both these places, there is no reason why it should not be possible to produce salt at Kuda at the same cost as at Kharaghoda.

(11) The Saurashtra Government should examine the possibility of railing Kuda salt to Navlakhi port for shipment to Calcutta.

(12) The works at Kuda should arrange to recover crude salt carnallite and magnesium sulphate from the bitterns obtained after the production of salt.

In addition to the recommendations of general nature which have been accepted and implemented by the Central Government, the following recommendations regarding these works have also been accepted:

(1) To recover crude salt carnallite and magnesium sulphate from the bitterns obtained at Kuda under similar conditions as suggested under Kharaghoda.

(2) To experiment on the manufacture of Kurkutch salt at Kuda instead of Baragara salt for use in the Soda Ash plant.

(vii) *Salt Works and their Particulars.*—There are at present the following 14 inland licensed salt works at Kuda and on the edges of the Little Rann of Kutch in Saurashtra, and their particulars are tabulated below:—

List of Inland Salt Works

Serial number	Name of the Salt Works	Year of commencement	Location	Acreage licensed	No. of pans	Production 1955 (up to Sept.)	Nearest loading station	Distance from Railway station
						'000 B. Mds.)		
1.	The Sir George Lloyed Salt Works. (Dhrangadhira Chemical Works.)	Pre-1922	Kuda Near (DHG) Zalawad District.	5,428	302	1,461	Kuda	3 Miles.
2.	The Mahalaxmi Salt Works.	1948	Do.	720	28	182	Do.	3 Miles.
3.	The Gandhi Salt Works	1949	Jesda (Near Kuda)	692	77	763	Do.	6 Miles.
4.	The Ambika Salt Mfg. Co-operative Society.	1951	Do.	250	84	161	Do.	6 Miles.
5.	The Bharat Salt Works	"	Venasar Near Khakhrechi M.S. District.	287	24	..	Khakhrechi	6 Miles.
6.	The Ajitgadh Sahakari Mandli Ltd.	1952	Ajitgadh, Near Halvad, Zalawad.	150	37	..	Halvad.	18 Miles.
7.	The Malaniad Agarja Co-operative Society	"	Malaniad, Near Halvad	100	76	..	Do.	14 Miles.
8.	The Zalawad Salt Mfg. Company	"	Jesda Near Kuda	250	58	392	Kuda	7 Miles.
9.	The Palia Salt Works	"	Do.	250	30	250	Do.	7 Miles.
10.	The Tikkar Agarja Co-operative Society	"	Tikkar Near Halvad	105	72	..	Halvad.	20 Miles.
11.	The Venasar Agarja Co-operative Society	"	Venasar, Near Khakhrechi	100	26	40	Khakhrechi	7 Miles.
12.	The Jogad Agarja Co-operative Society	"	Jogad, Near Halvad	100	65	..	Halvad.	16 Miles.
13.	The Ghanbila Agarja Co-operative Society	"	Ghanbila Madhya Saurashtra District.	100	27	..	Ghanbila	5 Miles.
14.	The New Ambika Mitha Udyog Sahakari Mandli.	"	Moti-Katechi, Near Sabli Rd., Zalawad.	50	4	..	Sabli Road	4 Miles.
TOTAL				8,677	910	3,249		

NOTE.—The first three works were in existence before the change of administration from 1-4-1950 and their details are given hereafter. The other eleven works started after this date.

(a) *The Sir George Lloyd Salt Works, Kuda.*—These are the oldest works in Kathiawar and Kutch and their history has been the history of the Salt industry in the Rann of Kutch. These were formally re-opened in 1923-24 when the British Government permitted the production of Baragara salt at Kuda in Dhrangadhra State under the Agreement of 1922-23. These works continued to be run by the Dhrangadhra State till 1939, when the same were leased to the Dhrangadhra Chemical Works, Ltd., under the Managing Agency of M/s. Govan Brothers, Ltd., when the "Shakti Alkali Works" belonging to the State were sold to them. The salt works have been, strictly speaking, leased to the Dhrangadhra Chemical Works, Ltd., and no royalty is to be charged for this exclusive manufacturing right. Under this Agreement of January, 1939, which was essentially for the sale of the Shakti Alkali Works, it was provided, (i) all salt lying at Kuda at that time was to be sold to the new company at prices to be agreed upon mutually, (ii) the company would be exempted from income-tax or super-tax, (iii) the State was to be supplied with its requirements of salt at the cost price, (iv) the company was to have exclusive right for the sale of salt outside Dhrangadhra subject, however, to the payment of royalty to Dhrangadhra State at the rate of 25% of the net profit realised by the company on such sales subject to a maximum royalty of three pies per maund; and (v) the State let to the company the State salt works together with lands, buildings, railway lines, rolling stock, machinery, etc. at a nominal rent of Rs. 451 per annum.

This management continued till 1949, when the Dhrangadhra Chemical Works Ltd. and the salt works were taken over by M/s. Sahu Brothers (Saurashtra) Ltd. During this period about eight lakh maunds of salt was being used annually for consumption in the Chemical Works and the system of disposal of the surplus stock has already been narrated under the history of the salt works from 1941-42 to 1946-47. From 1948-49 onwards, the surplus stock was taken over by the Dhrangadhra Salt Merchants' Association, Dhrangadhra, and the same was despatched by rail to the zonal areas fixed under the Zonal Scheme by its members at prices approved by the Saurashtra Government. However, since the middle of 1953, this Association has stopped functioning and issues to zonal areas are practically in abeyance since then. The works have recently, in January, 1950, entered into a fresh Agreement with the Saurashtra Government modifying the old Agreement of 1939. The following are the important modifications:

(1) The company has to pay a royalty to Saurashtra Govt. at the rate of Re. 0-2-3- per maund on the total quantity of salt sold by them every year.

(2) The company should manufacture at least 50 thousand tons of salt in addition to the quantity required by them for consumption in their works, and should make all efforts to raise the production of salt above the minimum specified.

(3) The company is to sell the salt manufactured by them surplus to their requirements to such parties as may be approved by the Saurashtra Government and the sales are to be effected in accordance with the instructions of that Government.

(4) The selling price of surplus salt is to be such as may be fixed by the Salt Commissioner, New Delhi.

(5) The salt manufactured by the company should be of the quality fit for human consumption and of the specifications laid down by the Government of India.

(6) 25% of the salt manufactured surplus to the company's requirements is to be kept in reserve.

(7) The company is to abide by the rules and regulations as may be framed by the Government of India from time to time.

The company is negotiating with the Saurashtra Government regarding the reduction of the royalty from Re. 0-2-3 per B. Md. to Re. 1-0-0 per ton on sale of salt for human consumption outside Saurashtra as has been done in the case of all other inland salt works from 15th June, 1953. Production and Issues since 1947 have been as follows:—

Year	Production (B. Mds.)	Total issues
1947	12,66,000	22,50,000
1948	15,79,000	19,55,000
1949	18,54,000	4,36,000
1950	18,80,000	22,90,000
1951	19,44,000	24,02,000
1952	21,89,000	19,70,000
1953	23,79,000	15,08,000
1954	7,12,000	..
1955	14,61,000	..

About 8 lakh maunds of salt is used annually for consumption in their soda ash works and the remaining quantity is meant for despatch to the consuming areas.

The salt works have under lease with them a total area of 5,428 acres, out of which 2,428 acres are lying undeveloped. Out of the area under use, about 160 acres are occupied by 319 crystallisers, 280' × 80-100' each, and wells are dug out at scattered places in an area of about 36 acres. The pans have been constructed in a systematic way in rows parallel to each other with a metre-gauge track running in between. Salt is transported in metre-gauge trucks taken on loan from the railways. During this haulage, the surplus stock is stored along the Kuda main line and sidings which are at a distance of about 2 miles from the main works, and about 8,00,000 B. Mds. salt is hauled up to the premises of the Dhrangadhra Chemical Works, situated near the Dhrangadhra railway station at a distance of about 14 miles. The works have made arrangements for the supply of water to the workers and quarters for accommodating the staff and the labourers have been built. The works are maintaining a laboratory where routine analysis of salt samples is carried out. The bittens are not being put to any use and are allowed to go waste.

The annual production of the works at present is about 19,00,000 maunds a year, their potential capacity under ideal conditions being 30,00,000 maunds, including the undeveloped area which can be brought.

under salt culture. The works are very seriously considering further development of their salt works and also to utilise the bitterns for the manufacture of by-products. They are, however, a bit hesitant to go ahead till the transport position shows improvement. The extension of their chemical works to double the production of soda ash is already under way.

(b) *The Mahalaxmi Salt Works, Kuda.*—These salt works came into being under a lease agreement executed in January, 1950 with retrospective effect from October, 1948, under which Shri Chandulal Manilal Chinani, promoter of the salt works, got lease of land from the Saurashtra Government, measuring about 440 acres near Kuda village, for purposes of constructing salt works there. The period of this lease agreement is 25 years from October, 1948. This agreement has been executed on the standard agreement form adopted by the Saurashtra Government for leasing out lands for salt works in the Rann of Kutch, the annual ground rent being Rs. 2 per acre and royalty at Re. 0-2-3 per maund of salt. This rate has, however, been reduced to Re. 1-0-0 per ton from the 15th June, 1953. The works obtained an area of 440 acres in 1948 and got further 280 acres in 1952, but only about 40 acres have so far been utilised. 40 pans, 280' × 50', covering an area of about 30 acres, and wells have been dug out to obtain subsoil brine. They started production in 1949, and quantities manufactured and issued since then are given below:—

Year	Production	Issues
	B. Mds.	B. Mds.-
1949	38,000	38,000
1950	1,50,000	21,000
1951	1,86,000	1,67,000
1952	2,01,000	1,45,000
1953	2,00,000	2,38,000
1954	1,82,000	..
1955	1,82,000	..

The pans have been constructed in a systematic way but no railway track has so far been laid out. Salt manufactured is transported to Kuda sidings by road.

The works started a small factory for the recovery of by-products from bitterns under the name of "The Mayurdhwaj Magnesia Works", Kuda and bitterns from their works were used in this factory. The by-products recovered were magnesium chloride, magnesium sulphate and potassium chloride. The potential capacity of the existing area is about 10,00,000 maunds, and scope exists for further developments, the limiting factor being the transport difficulties.

(c) *The Gandhi Salt Works, Jesda (Kuda).*—These salt works came into being in accordance with the agreement made in February, 1950, with retrospective effect from October, 1948, permitting Gandhi and Co. consisting of about 15 partners to manufacture salt in an area of about 1,000

acres near Jesda (Kuda) for a period of 25 years. The Agreement executed is in the standard form adopted by the Saurashtra Government, the annual ground rent being Rs. 2 per acre and royalty at Re. 0-2-3 per maund. This rate has, however, been reduced to Re. 1 per ton from the 15th June, 1953.

The salt works are situated near Jesda village about 5 miles from Kuda sidings, and hold a lease of about 1,300 acres of land, out of which 880 acres are being used for this purpose at present. The works have constructed 102 pans, 255' × 100' each, covering an area of about 60 acres and wells have been dug to feed the same with sub-soil brine. The pans have been constructed in a systematic way, in definite rows with storage platforms in between to facilitate the removal of salt. They started production in 1950, and production and issues since then are as follows:—

Year	Production	Issues
	B. Mds.	B. Mds.
1950	3,35,000	1,03,000
1951	8,03,000	6,75,000
1952	11,03,000	7,64,000
1953	7,60,000	9,71,000
1954	5,78,000	..
1955	7,93,000	..

The works have not yet been laid out with any haulage track and the salt is moved to Kuda sidings by road in motor trucks which necessarily raises the cost of salt ex-sidings.

The works have not yet constructed any quarters for the staff. Water is supplied to the works by motor trucks. The works continue to develop their activities and their potential capacity under ideal conditions is about 16,00,000 maunds. There is scope for further extension of the works, but the limiting factor is the transport.

The other salt works 10-11 of them, are new and were licensed in 1952 as a special famine measure to alleviate the sufferings and hardships of the poor agarias of these barren tracts and to encourage the formation of co-operative societies by granting them loans etc. The difficulties due to limited supply of wagons for the movement of salt to the consuming areas is proving to be formidable and the works are finding it difficult to continue their production activities at this level. In 1954, the production in the inland works registered a fall of about 2 lakh maunds. The Ministry of Railways (Railway Board) expressed their inability to increase the wagon supplies at the sources.

B.—KATHIAWAR AND KUTCH (MARITIME STATES)

We have already dealt with the development and present position of the salt industry at Kuda etc. which form inland salt sources on the edges of the Little Rann of Kutch. The history and development of the salt industry on the coast of the maritime States in Kathiawar and Kutch are dealt with now.

(i) *Historical.*—(a) *Prior and up to 1870.*—The salt industry on the coast of Kathiawar and Kutch is of very ancient origin indeed, and from times immemorial salt has been known to have been manufactured over its 800 miles long sea coast on tidal flats near estuaries and swampy lands. The littoral is the most favourable site in India for salt manufacture by solar evaporation on account of high winds, good tidal rise, comparatively high temperatures throughout the year, good density and purity of sea water, there being no fresh water discharges from large rivers along the coast, low rainfall and over and above good transport facilities. It seems that once upon a time there existed a flourishing industry on this coast and salt manufactured here not only met the local requirements of Kathiawar and Kutch States, but was also exported to other ports in India up to Calcutta and Rangoon and to the nearing foreign markets in East Africa, Ceylon, Maladive and Lacadive Islands etc. It was under the Treaty of Bassein in 1817 that the British Government succeeded to the exclusive right of the Peshwas to the salt works in Gujerat. About 1853 the Gaekwar instituted a vigorous agitation to establish salt works and open ports on the coast within his own territory. The Government of India contended that such rights had never been exercised by the Peshwas and declined to admit any such privilege claimed by the Gaekwar.

(b) *From 1870 to 1920.*—About 1870 Government adopted the policy of concentration of manufacture of salt in certain areas where it could be economically manufactured and conveniently guarded. Government also wanted to stop smuggling into British territory of salt produced in the Kathiawar Peninsula and within the borders of the remaining Indian States. So treaties and agreements were entered into with the various Indian States. Though as early as 1837, under Act XXVII of that year, a regular duty of eight annas per maund was first levied in Bombay Presidency in lieu of transit duty, the growth of this industry on this coast was attempted seriously only in about 1870. In his report, Mr. W. G. Peddar, Officer on Special Duty, made the following important recommendations with a view to safeguard the salt revenue interests of the Government, which radically affected the interests of this coastal industry in Kathiawar and Kutch:—

(1) Concentration of manufacture of salt at the sea salt works in the southern division and suppression of small scattered sea salt works, difficult and expensive to guard and producing less than 5,000 maunds annually.

(2) Prevention of smuggling of salt from foreign territories, including Kathiawar and Kutch, by strengthening of the establishment on the Northern and Portuguese Frontiers, and keeping a proper guard along the sea coast of the Bombay Presidency to prevent illicit landing of Kathiawar or non-duty-paid salt removed to Calcutta and places in the Madras Presidency.

This reorganisation of the whole salt administration and the new policy led to the closure of the salt works on the West coast. At the same time, the Transport of Salt Act XVI of 1879 was enacted to prevent illicit landing of non-duty-paid salt from Kathiawar, Daman, and Goa. This Act extended to the Western coast of British India, North of Cochin, and to the sea within a distance of a marine league (about 3 miles) from such coast, and the object of this enactment was to prevent smuggling of non-duty-paid salt in country crafts creeping down the Western coast of British India and North of Cochin, which was inundated with numerous navigable

creeks since such salt was available in large quantities all along the coastal line of Kathiawar and Kutch. Under this Act no country craft below 300 tons burthen could possess salt within a radius of a marine league from the aforesaid coastal line, except on the following conditions:--

- (1) Salt was covered by a permit granted by a duly authorised revenue officer;
- (2) Salt carried on board any vessel was for consumption by her crew or by the passengers or animals, if any, on board; and
- (3) Salt was exported from the sea salt works to Cochin and Travancore States.

Any breaches of this Act were made punishable with fine which might extend to Rs. 1,000 or with imprisonment which might extend to 6 months or with both. It was also laid down that any master of a vessel refusing or neglecting to bring to or to produce his papers when required to do so by an officer acting under this Act, and any person obstructing any such officer in the performance of his duty were made liable to arrest by such officer without a warrant and were liable to be punished with fine which might extend to Rs. 1,000 or with imprisonment which might extend to 6 months, or with both. In addition, every vessel in which salt was carried so as to render the owner or master of such vessel liable to the penalties prescribed under the Act, the cargo on board such vessel and all salt in respect of which an offence under this Act had been committed were made liable to confiscation.

Though this enactment of 1879 contained very severe punishments for any of its breaches the British Government considered it necessary to enter into engagements with the various maritime and inland States in Kathiawar and Kutch, and in the year 1883 agreements were made with all these States for the regulation of the manufacture of, and trade in, salt. The general effect of these Agreements concluded was to bind them to take such measures for the protection of British Salt Revenue as were required by the local situation and circumstances of these States. An altogether separate Agreement was executed with Dhrangadhra State in 1883, which has been dealt with separately under Kuda Salt (inland salt sources). The manufacture of Baragara salt was absolutely forbidden in these States. These Agreements were of three kinds, viz.

(a) The first was executed by the six Chiefs of maritime salt producing States, viz. Junagadh, Nawanager, Bhavnagar, Morvi, Jafraabad and Porbandar;

(b) The second was executed by the four Chiefs of non-maritime and salt producing States, viz. Lakhtar, Limbdi, Vala and Maliya; and

(c) The third was by other about 25 inland States, which were neither maritime nor salt producing. These engagements are given below, as, for the first time in the history of Kathiawar States, direct restrictions on the production of salt were imposed by the same.

(A) Salt Agreement No. XXXIII signed by the Maritime States in 1883.
(Junagadh, Nawanager, Porbandar, Bhavnagar, Jafraabad and Morvi)

".....recognising the rights of the Paramount Power and the duty incumbent on the Chiefs of Kathiawar so to regulate the production of salt in Kathiawar for the consumption of its inhabitants that no salt produced

in Kathiawar may be conveyed into the British districts contrary to the law of British India and to the injury of the salt revenue of the British Government, agrees as follows:—

1. That the production of salt in his State, as hitherto carried on, will continue, but the quantity produced or removed shall not exceed the quantity required to meet the demand for consumption thereof within the province of Kathiawar.

2. That the salt manufactured within his State shall be sea salt only, that is, salt made from seawater or brine wells as heretofore. That no Vadagra salt shall be manufactured within his State.

3. That salt may only be exported from his State by sea to some other place in his own State, and then only under special arrangements made by his State, all removals of salt by sea by private individuals from one place to another being prohibited. That fishing boats belonging to this State may ship, when leaving place in his State, a quantity of salt not exceeding 25 maunds to be used for *bona fide* fish curing purposes. That no salt shall be imported into his State by sea from places outside Kathiawar, except salt which has paid the salt tax of the British Government, and is covered by a British *ravana*.

4. That his administration will be responsible for the observance of the above conditions by all classes of his subjects. That he will prevent, to the utmost of his ability, the export of salt from Kathiawar by land either into another foreign State or into British India.

5. That he will not enlarge or make any material change in the existing salt works, nor open any new works or salt source in his State, nor permit any salt works or source to be altered, enlarged or opened, without the previous consent of the Government of Bombay, obtained through the Political Agent in Kathiawar.

6. That the salt works and salt deposits within his State shall at all times be open to the inspection of the Political Agent, or the Assistant Political Agent; and that full information on all subjects connected with the production and distribution of salt in his State shall be supplied to the above mentioned officers when required."

(B) Salt Agreement XXXIV signed by non-maritime salt producing States in 1883 (Limbdi) Lakhtar, Maliya and Vala.)

".....recognising the rights of the Paramount Power and the duty incumbent on the Chiefs of Kathiawar so to regulate the production of salt in Kathiawar for the consumption of its inhabitants that no salt produced in Kathiawar may be conveyed into the British districts contrary to the law of British India and to the injury of the salt revenue of the British Government, agrees as follows:

1. That the production of salt in his State, as hitherto carried on, will continue, but the quantity produced or removed shall not exceed the quantity required to meet the demand for consumption thereof within the province of Kathiawar.

2. That the salt manufactured within his State shall be sea salt only—that is salt produced from seawater or brine wells or naturally deposited as heretofore. That no Vadagra salt shall be manufactured within his State.

3. That his administration will be responsible for the observance of the above conditions by all classes of his subjects. That he will prevent, to the utmost of his ability, the export of salt from Kathiawar by land either into another foreign State or into British India.

4. That he will not enlarge or make any material change in the existing salt works, nor open any new works or salt source in his State, nor permit any salt work or salt source to be altered, enlarged or opened without the previous consent of the Government of Bombay obtained through the Political Agent in Kathiawar.

5. That the salt works and salt deposits within his State shall at all times be open to the inspection of the Political Agent or the Assistant Political Agent, and that full information on all subjects connected with the production and distribution of salt in his State shall be supplied to the above mentioned officers when required."

(C) *Salt Agreement No. XXXVI signed by inland States in 1883 (Vankaner, Palitana, Dhrol, Rajkot, Gondal, Wadhwan, Sayla, Chuda, Jasdan, Manawadar (Bantwa), Gidad and Bantwa, Lathi, Muli, Virpur, Cotda-Sangani, Jetpur, Mengni, Jalia, Vagridad, Pal, Gadhka, Vasavad, Dedan, Bagasra, Vichhavad and Kuba).*

".....recognising the rights of the Paramount Power and the duty incumbent on the Chiefs of Kathiawar so to regulate the production of salt in Kathiawar for the consumption of its inhabitants that no salt produced in Kathiawar may be conveyed into the British districts contrary to the law of British India and to the injury of the salt revenue of the British Government, agrees as follows:—

1. I will make due arrangements that my State shall be supplied with salt sufficient for the consumption of the population licitly obtained from some recognised salt source.

2. My administration will be responsible for the observance of the above conditions by all classes of my subjects. I will prevent, to the utmost of my ability, the export of salt from Kathiawar by land either into another foreign State or into British India.

3. Salt shall be sold in my State by licensed vendors only who will procure their supplies through the Darbar only. A list of *parvanas* will be kept, and each licensed vendor will be required to show his books to the Darbar whenever called on to do so, and to account for all the salt which he may have procured through the Darbar.

4. The stocks of salt in hand shall never exceed the quantity required for local consumption."

Soon after, in 1885, the Rao of Kutch also undertook, on the lines of the maritime States in Kathiawar, to prevent the exportation from his State of Kutch, of salt manufactured or produced within his State to any port in British India or of any Indian State or of any foreign European Settlement in India, and an Agreement was made to this effect with the State in 1885 restricting the production of salt in his State and stopping its export to the remaining parts of India, with a view to safeguard the salt revenue interests of the Government. This Agreement is reproduced below and, as will be seen from clauses 5, 6 and 8, this State was particularly permitted to export salt from its State to foreign ports outside India, which concession had not been till then given to any other maritime States in Kathiawar.

— "Salt Agreement with the Rao of Kutch—1885.

His Highness the Rao agrees on behalf of himself, his heirs and successors as follows:—

1. That the Darbar of Kutch shall adopt effectual means to prevent the exportation from Kutch, either by sea or by land, of salt manufactured or spontaneously produced in the State to any part of British India or any foreign European Settlement in India.

2. That the Darbar of Kutch shall exercise an efficient control over the manufacture of salt and the collection of natural salt within Kutch territory.

3. That the Darbar of Kutch shall make careful arrangements to watch the land and sea frontiers of Kutch with a view to prevent exportation of salt from any part of Kutch to any part of British India, or of any Indian Native State, or of any foreign European Settlement in India.

4. That the Darbar of Kutch shall, by public notification, prohibit, under pain of severe penalty, the exportation of salt from Kutch either by sea or by land to any part of British India, or of a Native Indian State or of any foreign European Settlement in India.

5. That the Darbar of Kutch shall so regulate the export of salt from Kutch to foreign ports outside India, and shall place such export under such safeguards and checks as to prevent any salt so exported from finding its way into any part of British India, or of any Native Indian State, or of any foreign European Settlement in India.

6. That the Darbar of Kutch shall not permit salt to be exported from Kutch to any foreign port outside India unless the vessel containing it is bound direct for that port.

7. That no vessel bound from Kutch to any port situated in British India, or a Native Indian State, or any foreign European Settlement in India, shall be permitted to carry salt as its sole cargo or as part of its cargo.

8. That the Darbar of Kutch shall bind the owner or Captain of any vessel carrying salt for exportation from Kutch to any foreign port outside India not to touch on the voyage at any port in British India, or in a Native Indian State, or in a foreign European Settlement in India, unless driven thereto by stress of weather, and in case he is so driven to any such port to give the earliest intimation of arrival to any British or Native Officer residing at the port, and not to land any part of the salt contained in the vessel at such port.

The Governor-in-Council of Bombay agrees that so long as the Darbar of Kutch fulfils the conditions aforesaid, the system and rules established in Kutch in one thousand eight hundred and eighty and now in force with regard to salt shall by and remain in abeyance.

And His Highness the Rao agrees on behalf of himself, his heirs and successors, that if at any time the Darbar of Kutch fails to fulfil the said conditions the British Government shall be at liberty to reintroduce the said system and rules of one thousand eight hundred and eighty.

"Dated at Bhuj, the 16th January, 1885."

A couple of years later in 1887 the Gaekwar of Baroda also entered into a similar Agreement with the Government putting the salt arrangements in his Kathiawar possessions on much the same footing as obtained at that time in other States of that province. This Agreement of 1887 is reproduced below:—

"Salt Agreement No. XXXV of 1887 signed by the Gaekwar of Baroda.

ARTICLE 1

The manufacture of salt in the Kathiawar possessions of the Baroda Government will be limited to natural salt, i.e. salt made from seawater

or natural brine deposits or wells, and only such quantity will be made as shall be sufficient for local consumption and for export as hereinafter provided.

ARTICLE 2

Effectual means shall be taken to prevent the import of salt by sea from Okhamandal for the supply of the Amreli Mahals into the adjacent Kathiawar States, and efficient measures shall be adopted by the officials of the Baroda State to prevent the export of salt by land or sea from the Amreli Mahals or Okhamandal into any of the States of Kathiawar. No salt imported into the Amreli Mahals from Okhamandal shall be landed anywhere but at Kodinar or Velan.

ARTICLE 3

The Government of Baroda will adopt effectual means to prevent the exportation from its possessions in Kathiawar, either by sea or land, of salt manufactured or spontaneously produced therein to any part of British India or of any Native Indian State, or of any foreign European Settlement in India, and will publish a Notification prohibiting such export under severe penalty.

ARTICLE 4

The Government of Baroda will exercise an efficient control over the manufacture of salt and the collection of natural salt within its possessions in Kathiawar.

ARTICLE 5

The Government of Baroda will so regulate the export of salt from its possessions in Kathiawar to foreign ports outside India, and will place such export under such safeguards and checks as to prevent any salt so exported from finding its way into any part of British India or of any Native Indian State or of any foreign European Settlement in India.

ARTICLE 6

The Government of Baroda will not permit any salt to be exported from its possessions in Kathiawar to any foreign port outside India, unless the vessel containing it is bound direct for that port.

ARTICLE 7

No vessel bound from the possessions of the Government of Baroda in Kathiawar to any port situated in British India, or a Native Indian State or any foreign European Settlement in India, will be permitted to carry salt as sole cargo or as part of its cargo.

ARTICLE 8

The Government of Baroda will bind the owner or captain of any vessel containing salt for exportation from its possessions in Kathiawar to any foreign port outside India, not to touch on the voyage any port in British India, or a native Indian State or a foreign European Settlement

in India, unless driven to it by stress of weather in which case he shall be bound to give the earliest intimation of arrival to any British or Native officer residing at the port and not to land any part of the salt contained in the vessel at such port.

ARTICLE 9

Fishing-boats belonging to the possessions of the Baroda Government in Kathiawar may ship, when leaving a place in the said possessions, a quantity of salt not exceeding twenty-five Indian maunds to be used for *bona fide* fish-curing purposes.

ARTICLE 10

No modification of these arrangements shall be made without the previous consent of the British Government and the Baroda State.

Signed at Baroda on the fourteenth day of March one thousand eight hundred and eighty-seven."

Thus, as will be seen from these Agreements concluded between 1883 and 1887, the activities of the salt manufacturers in the maritime States on the coast of Kathiawar and Kutch were curtailed drastically, and they had to limit their production only to meet the local requirements and the labourers and persons engaged in this profession had to leave the same for better occupations, and this industry was brought to an insignificant stage by about 1890.

(c) *From 1920 to 1930.*—These restrictions continued in their severity till about 1919 when the Gaekwar of Baroda pressed his claims to the British Government for a revision of his Agreement of 1887, and requested for permission to open new salt works in his Kathiawar possessions (now forming Amreli district in Bombay State) to manufacture salt with a view to export it to Calcutta, where foreign salt was being imported in huge quantities, and also to produce various by-products from bitterns. The Government ultimately agreed in 1922, and Article 3 of the Agreement of 1887 was modified, and the export of salt from Okha mandal and Kodinar (Gaekwar possessions in Kathiawar) was permitted to Calcutta by sea subject to the following conditions:—

- (1) Salt to be exported by sea alone and not by rail.
- (2) All salt to be bagged.
- (3) Duty to be levied at the port of embarkation.
- (4) The shippers to have accommodation only at the Salkia salt golas on the same terms as Bombay and Madras duty-paid salt, that is, if it can be provided without interference with the bonding of dutiable salt.
- (5) Salt to be transported in bulk if steamers are employed provided salt is carried in bags from the works to the steamers and re-weighed there before emptying into the hold.
- (6) Account of salt to be kept to enable the Bombay Salt Department to know what quantities are being exported.
- (7) A permit (in addition to ordinary shipping papers required for customs purposes) to accompany each consignment.

(8) Rebate up to 5 per cent of duty levied on salt to be granted by the Government of India in respect of salt proved to be destroyed in transit.

This revision of Article 3 in 1922 meant in practice a great potential opening for the salt industry on the Kathiawar coast, and the other maritime States also started negotiations with the British Government, with a view to obtain similar revision of their Agreements of 1883, which had been conceded to in the case of the Gaekwar of Baroda. At the same time, they initiated investigations into the possibilities of manufacturing salt on their coasts, with a view to export the same to Calcutta. At this stage, the late Mr. Kapilram H. Vakil was engaged on the investigations in connection with the manufacture of by-products from the bitterns produced from the salt works at Kuda in Dhrangadhra State. He had earlier (1918-1920) undertaken an extensive survey on the Orissa and Bengal coasts on behalf of The Tatas of Bombay, with a view to ascertain the possibilities of manufacturing salt there. Kathiawar coast soon attracted his attention and he undertook extensive surveys on this coast and devoted particular attention to the Kathiawar possessions of the Gaekwar of Baroda. Mr. Vakil, after making detailed observations and practical experiments at Kodinar, Velan, Okhamadhi etc., ultimately decided to establish salt works near Okha at a place now called Mithapur. The Baroda State had also opened Okha Port a year before and exports could be conveniently made from this new port. He had, in his view, particularly production of such a quality of salt which should not only find a ready market in Calcutta and be able to compete with the imported salt there, but be also fit enough for use for the production of Soda Ash and heavy chemicals, which he proposed to start in the vicinity of the salt works. He had also planned the recovery of by-products from the bitterns on a scientific way, and carried out intensive research in this direction. His efforts were ultimately crowned with success, and the Okha Salt Works were formally opened in 1927, and this opening of a regular salt works on the West Coast marked the birth of a new industry, which had so far been suppressed by the Government, and started attracting the attention of industrialists to open more salt works on this coast. The history of the Okha Salt Works, as they were known then, but now called "The Tata Chemicals, Ltd." is, in fact, the history of the revival of the salt industry in Kathiawar, and every credit goes to the foresight, initiative and perseverance of the late Mr. Kapilram H. Vakil. He met with considerable difficulties in the initial stages in establishing salt works against competition with foreign imported salt but it was largely due to his persistence and the enterprise of other manufacturers after permission was granted that this industry was established in Kathiawar.

The first crop from the Okha Salt Works produced about the end of 1927 attracted the attention of all the maritime States in Kathiawar and Kutch, viz. Bhavnagar, Junagadh, Jafrabad, Porbandar, Nawanager and Kutch, who all approached the British Government for permission to export salt to Calcutta as had been given to the Baroda State, in revision of their previous Agreements made in 1883. In 1928-29, all these maritime States were permitted to undertake production of salt in their respective States for purposes of export to Calcutta, and the old Agreements of 1883 were suitably revised. This resulted in opening of private salt works in almost all the maritime States one after another under certain concessions and monopolistic rights. Large scale salt works were opened at Lavanpur (Moryi State) in 1929 and at Porbandar (Porbandar State) in 1931, and they started production soon after. They were soon followed by large works at Kandla (Kutch State) and at Bedi Port, Jamnagar (Nawanager

State), whose construction started in 1934 and 1936 respectively. In 1928-29, when all the maritime States in Kathiawar and Kutch were permitted to export salt by sea to Calcutta and Rangoon, a set of rules were framed by the Government of India to govern such exports. These rules, reproduced below, were subsequently made applicable to Kutch State also.

“Rules for the export of salt by sea from the Bhavnagar/Nawanagar, Porbandar/Morvi/Junagadh/Janjira (Jafrabad) States

N. B.—The term “Steamers” in these rules includes “Motor vessels”.

1. The State shall take all proper measures to ascertain the quantity of salt shipped.

2. This quantity shall be shown in the ship's Export Manifest.

Note.—Applicable to Bhavnagar, Nawanagar and Morvi States.

3. (a) *Vessels lying at anchor*: The salt shall be conveyed from the shore to the vessel by lighters or boats in strong bags of uniform size which shall be tallied on board by a responsible officer. If the salt is to be exported in a sailing vessel the bags shall be stowed on such vessel intact. If it is to be exported by steamer the bags may be emptied into the steamers holds.

(b) *Vessels loading alongside the quay*: The salt shall similarly be placed in bags and tallied on board, if the ship is a sailing vessel. If it is a steamer, the salt may be emptied into the holds, after tally. It will be optional to convey the salt from the works to the steamer in bulk in railway trucks, salt so conveyed shall be passed over a weigh-bridge before loading

Note.—Applicable to Morvi State only.

3. (a) (i) *Vessels lying at anchor*: (i) If the salt is to be exported in a sailing vessel, it shall be conveyed from the shore to the vessel by the lighters or boats in strong bags of uniform size, which shall be tallied on board by a responsible officer and shall be stowed on the vessel intact.

(ii) If the salt is to be exported in a steamer, the salt shall be similarly conveyed to the steamer in bags, but these may be emptied into the steamer's holds after being tallied on board. Where, however, the authorities in the Port maintain a close supervision over the movements of the lighters during their transit from shore to steamer, the condition about bagging may be waived, provided the salt is accurately weighed into the lighters or boats at the shore.

(b) (i) *Vessels loading alongside the quay*: If the salt is to be exported by a sailing vessel, it shall be loaded and stowed there in bags of uniform size which shall be tallied on board by a responsible officer.

(ii) If the salt is to be exported by steamer, it may either similarly be loaded in bags or brought to the steamer in bags of uniform size, which shall be emptied into the holds after tally or brought in bulk from the works to the steamer where it shall be weighed into the ship over scales or if brought on railway trucks over a weighbridge.

4. If the salt is to be conveyed in bulk in the holds of a steamer no hold containing salt shall be loaded with other cargo.

5. The hatches containing bulk salt will be sealed by the Port Officer Bhavnagar/Nawanagar/Porbandar/Morvi/Junagadh/Janjira (Jafrabad) and shall remain with the seals intact throughout the voyage. Unless the salt

is destined for a foreign port the seals will be broken on arrival of the ship at destination by the proper officer of Customs, to whom a copy of the seal should be sent before the first consignment is despatched so that the seals on the hatches can be checked on arrival at destination. If the salt is destined for a foreign port the seals shall not be broken until after the vessel has for the last time in the course of the voyage concerned, passed out of Indian territorial waters.

6. The vessel shall not enter any port in British India *en route* but shall proceed direct to its destination, provided that this rule need not be enforced if the vessel has holds in which the salt can be loaded unmixed with other cargo and the hatches of which are capable of being sealed.

Export of Non-duty paid salt to Bengal and Burma.

7. Provisions as to loading, etc., shall be as above.

8. The salt shall not be loaded except in steamers or sailing vessels of not less than 1,000 tons gross burthen.

9. Intimation giving the following particulars:

Name of vessel and Co. (if a liner), Name of exporter, Quantity in Bengal maunds of salt exported, Destination, Date of port clearance, should be sent to the Collector of Customs of the port of import in Bengal Burma and to the Collector of Salt Revenue Bombay.

The intimation sent to the Collector of Customs should be endorsed with or accompanied by a certificate signed by some suitable official designated by the Darbar in this behalf, stating the name and place of the salt works at which the salt was produced.

10. The Collector of Customs of the port of import in Bengal/Burma will notify the Collector of Salt Revenue, Bombay of the outturn of the salt giving the following details:—

Name of vessel and Co. (if a liner), Name of importer, Quantity of Bengal maunds of salt imported, Date of entry inwards of the vessel, Date of completing the landing of the salt.

Export of salt to Bengal/Burma in vessels of less than 1,000 tons gross and over 300 tons burden. Salt shall not be exported to these ports in vessels of less than 300 tons.

11. Provisions as to loading, etc., shall be as laid down in rules 1 to 6.

12. Full duty shall either be recovered or its recovery secured by the State under the Salt Credit Bond rules. The amount of duty or of the Credit Bond shall be payable to the Collector of Salt Revenue, Bombay subject to the deduction on account of wastage as provided in rule 14 below.

13. The consignment shall be accompanied by a permit a copy of which shall be sent to the Collector of Salt Revenue, Bombay. The State shall keep such accounts as will enable the Bombay Salt Department to know what quantities are being exported.

14. On receipt of the outturn report from the Collector of Customs of the port of import in Bengal/Burma as in rule 10 above, the exporter shall be entitled to a refund of duty on the actual wastage up to 5 per cent of the quantity shipped, or if he has removed salt under the Salt Credit Bond System he will be allowed a credit to that extent.

15. Shippers will understand that accommodation at the Golas will only be obtainable if it can be provided without interfering with the warehousing of dutiable salt.

Export of salt to countries outside British India permissible only in vessels of not less than 300 tons burthen.

16. Full duty shall either be recovered or its recovery secured by the State before shipment. If the recovery is secured the amount shall be payable to the Collector of Salt Revenue, Bombay, unless the security is discharged as provided in rule 18 within six months.

17. The consignment shall, in transit, be covered by a permit granted by an officer of the State duly empowered in this behalf, which shall specify the particulars laid down in section 31 (2) of the Bombay Salt Act (Bombay Act No. II of 1890). A copy of the permit shall be sent to the Collector of Salt Revenue, Bombay.

18. On receipt of an outturn certificate from the proper officer of Customs at the place of destination the amount of duty shall be refunded to the exporter subject to deduction of the amount, if any, by which the quantity landed falls short of 95 per cent of the quantity shipped; or if the exporter has given security, his security shall be discharged to this extent. The form of report shall be the same as in Rule 10 except that the quantity shall be given in tons avoirdupois. It will be the duty of the State to arrange for this outturn report and the despatch within four months of the date of shipment, of a copy of it to the Collector of Salt Revenue, Bombay, together with duty on the amount, if any, by which the quantity of salt landed has fallen short of 95 per cent of the quantity shipped, it being presumed that the salt so short-landed has passed into British India without payment of duty."

At the instance of Morvi State, however, carriage of salt in loose was permitted from the works to the steamer holds.

(d) *From 1930 to 1947.*—Though the export of salt to Calcutta started from 1928 and the quality could very well compete with the imported salt the foreign importers with a view to crush the indigenous industry, reduced their prices in Calcutta market, as a result of which the local manufacturers were put to a severe test indeed. During this period in 1926, the Indian Taxation Enquiry Committee had stressed the extreme importance of a well developed salt industry in India for her economic advance and had strongly pleaded for making India self-sufficient and recommended an enquiry by the Indian Tariff Board. The Central Board of Revenue thought that the different salt producing areas in India could not be developed to such an extent as to make India self-sufficient in her requirements of salt. The Government of India having accepted this view, the matter was taken up and in 1929 the Tariff Board was asked to report "whether having regard to all relevant considerations it was desirable in national interests to take steps to encourage the production of salt in India suitable for markets then served with foreign salt and what measures were to be adopted". The

Tariff Board submitted their report in September 1930 and they held the view that even fine white crushed salt of the quality requisite to enable the foreign article to be entirely replaced in the Bengal market could be produced in India. They recommended that for this purpose Aden should be treated as part of India, in preference to other foreign exporting countries. One of their recommendations was that the Government should undertake a thorough enquiry into the potentialities of the various salt sources in India, as a result of which, the Salt Survey Committee was constituted in 1931. Soon after this, the question was taken up by a special committee of the Legislative Assembly who recommended an immediate imposition of an additional duty of 4 annas per maund on all salt, Indian and foreign imported by sea into British India, and that a rebate equal to the additional duty should be granted on the imported Indian salt on the producer undertaking to deliver a stipulated quantity of salt to the Government at any time at the fair selling price fixed by the Tariff Board. As a result of this important recommendation, the Salt (Additional) Import Duty Act, 1931 came into being from 18th March, 1931. Under this, a duty of Re. 0 4/6 per maund was levied on all salt Indian or foreign, imported by sea into British India and a rebate equal to this was to be allowed on imported Indian salt, Aden being considered as a part of India. Later on, this Act was extended up to the end of financial year 1932-33. The fundamental object of this Act was to stabilise the prices of salt in Calcutta market and to assist the Indian salt industry against foreign competition in the Bengal market and to secure to the Indian manufacturer an economic and fair selling price for the salt that he may export to that market. No doubt, this important Act gave protection to Aden salt manufacturers, but at the same time, this proved a great boon to the young industry in Kathiawar, and the imports of foreign salt started declining and demands for Indian salt increased progressively. The position of the indigenous industry was, however, reviewed in March, 1933, and the protective duty was reduced to Re. 0 2/6 per maund under the Salt Additional Import Duty (Extending) Act of 1933. This revision of extra duty did not result in the increase of imports of foreign salt and the imports from Aden and Indian sources into Bengal continued to increase. This Act was further extended up to 30th April, 1936. In April 1936, the operation of the Salt (Additional Import Duty) Act of 1931 was extended by two years but the protective duty was reduced to 1½ annas per maund. This protection was, however, completely withdrawn in 1939. As said above, the salt manufacturers of Aden continued to enjoy this protection along with the manufacturers of Kathiawar and Karachi up till 31st March, 1937, when Aden was separated from India. After the separation from 1st April, 1937, the salt manufacturers of Aden made a bid for a while to hamper the development of the Indian salt industry by waging a rate war, but because of the outbreak of World War II and due to the political and fiscal conditions in this country, an end was put to their such activities. It should, therefore, be noted that but for this timely protection afforded by the Government of India from 1931 to 1939 in the way of this protective duty, the young salt industry of Kathiawar would not have perhaps been able to survive.

With the outbreak of World War II in September, 1939, and the shipping difficulties that followed, the salt industry in Kathiawar received a great fillip, as a result of which large salt works were started at Bhavnagar in 1943, at Jafrabad and at Bherai (Junagadh State) in 1944, under certain favourable concessions and on monopolistic basis.

In 1936, the Okha Salt Works at Mithapur in Baroda State were specially permitted to export their refined table salt by sea or rail to British

India (Bombay and Sind) under certain rigid rules. According to these rules, the quantity to be imported into British India was limited to 2,000 maunds and the salt was subject to the same duty as the salt produced in British India and was further subject to the usual customs examination and procedure. The salt had to be packed in containers suitable for sale in paper bags, bottles or tins. The salt was to be imported by sea only at the ports of Bombay and Karachi and by rail only at Viramgam, the railway wagons were to contain no other commodity.

In 1941-42, at the request of these works and States, the Government further permitted movement of salt produced in these maritime States by rail to Calcutta under some conditions which *inter alia* included:—

- (i) that the exporter will deposit into treasury an amount equivalent to duty on the quantity to be exported;
- (ii) the exporter will present an invoice in quadruplicate to the Salt Officer with a declaration that the salt is intended to be exported to Calcutta;
- (iii) the State Salt Officer will have the bags weighed and seal them;
- (iv) the consignments received at Viramgam will be checked by the Salt Inspector to see if the seals of the wagons were in tact and will also test weigh the consignments to the extent of 15%;
- (v) if bags were found in excess of the quantity covered by the invoice, the excess will be detained and a further deposit of duty will be asked for; and
- (vi) the consignments on arrival at Calcutta were to be checked by the Collectorate of Central Excise and Salt, N. E. India.

(e) From 1947 to March, 1950.—With the abolition of excise duty on salt with effect from 1st April, 1947 and the termination of the British Rule in India from the 15th August, 1947, the whole excise policy of the Government of India so far as it related to production and sales of salt, underwent a fundamental change and all possible steps were taken to develop this indigenous industry on a rational and scientific basis. By the time about half a dozen big salt works had been opened in Kathiawar and Kutch and were enabled to stabilise themselves during World War II. Though there were no restrictions on the imports of salt from foreign countries, these could very well compete with other salts in Calcutta market, both in prices and quality. The construction of more than one salt works in the States of Kutch, Morvi, Baroda (Kathiawar possessions), Porbandar, Junagadh, Jafarabad and Bhavnagar, all maritime States, could not take place, since all the salt works in these States had obtained monopolistic rights from the then princely States concerned. The only notable exception was in the case of Nawanagar State, where His Highness the Jam Saheb with the voluntary concurrence of the Digvijaysinhji Salt Works Ltd., Jamnagar, (which held monopoly for salt manufacture in this State) sanctioned the opening of three more salt works in this State, viz., at Rozi Port, Salaya and Jodiya in 1947-48. Such monopolistic rights were proving a serious handicap to the Government's intention of developing this industry on this coast. Early in 1948, due to the political and constitutional changes in India, all the maritime States of Morvi, Navanagar, Porbandar, Jafarabad, Junagadh, Bhavnagar etc., were integrated into the United States of Saurashtra (a part B State) and Kutch State was declared as a part C State under a Chief Commissioner's jurisdiction, and the Kathiawar possessions of Baroda State were integrated in Bombay State and a new district with headquarters at Amreli was constituted. These new States, had every

intention to start more salt works in their jurisdiction and many applications were received from industrialists to open new salt works, but were unable to take any decision due to the political changes in quick succession, and the whole position continued to drift.

(f) *From 1st April, 1950 till date.*—With the Federal Financial Integration of Part B and C States from 1st April, 1950 and as a result of the Indian Finance Act, 1950, the Central Excise and Salt Act and Rules, 1944 were made applicable to the United States of Saurashtra and Kutch from 1st April 1950, when the salt administration in these two States was taken over by the Government of India and placed under the charge of the Salt Commissioner, New Delhi. In accordance with Notification No. 26 dated the 2nd December, 1950, Rules 107 to 115 (inclusive) of the Central Excise and Salt Rules, 1944 were made applicable to these two States. Accordingly all the existing salt works were licensed and a cess of two annas per B. md. was levied on all issues of salt from licensed salt factories, except by sea to Calcutta, with effect from the 1st April, 1950 as laid down in Government of India, Ministry of Finance's Notification No. 3 dated 29-3-47. This exemption from cess was, however, extended also to issues by sea to Japan *vide* Government of India, Ministry of Finance's Notification No. 17 dated 8-7-50, From the 1st February, 1952, exemption granted for issues by sea to Calcutta was, however, withdrawn *vide* Government of India, Ministry of Finance's Notification No. SRO 150 dated the 28th January, 1952. Such charges are recovered on the quantity issued as recorded in the Export General Manifests of the shipments concerned. These are recovered in advance and all the salt works have opened accounts current with the Department to facilitate such recoveries.

The Saurashtra Government, at the instance of the Government of India, soon undertook to terminate all the monopolistic rights and all these were cancelled with the consent of the works concerned. This opened the way for starting more salt works in this State.

The Chief Commissioner, Kutch State terminated the monopolistic rights of the United Salt Works and Industries, Ltd., Kandla *vide* his order No. J 55 of 1950 dated 18-4-50, and the Bombay Government have similarly terminated the monopolistic rights of the Tata Chemicals Ltd., Mithapur in the Amreli District (former Kathiawar possessions of Baroda State) *vide* their Order No. MNL. 1551/32107 B dated 9-8-1951. Since then new marine salt works have been leased and licensed in these States.

All the old restrictions imposed on the export of salt by sea to other Indian ports were withdrawn by the Central Government in 1949 and suitable amendments were made in the relevant section of the Central Excise and Salt Act, 1944, governing the export by sea of excisable commodities. However, under the Control of Shipping Act, 1947, the Central Government had suspended from December, 1950 the import by sea of salt from Kathiawar and Kutch ports to Bombay; but even this restriction has since been withdrawn, and there are no restrictions now on its export to other ports in the Republic of India. Now salt can move by sea to any port in India without any restrictions whatsoever. These maritime salt works have, however, been kept out of the Zonal Scheme and they can despatch salt only under ordinary traffic as non-programmed salt, subject to the availability of wagons from the Railways.

The recent development of this Industry on this coast has not only made India self-sufficient in this essential commodity, but even exports

have started since 1951. During 1952, 1953, 1954 and 1955 India exported 79.5, 80.00, 61.3 and 55.6 lakh maunds to foreign countries respectively, most of the salt going to Japan.

Licensing of existing and new salt works

With the application of the C.E. & Salt Act 1944 Act and Rules, all the existing salt works in Saurashtra and Kutch States came under the purview of the Central Act, and a Provisional Form of License was adopted for licensing them under Rule 103 of the same. All the old and new salt works sanctioned after 1-4-1950 have been licensed under this form.

Leasing of old and new sites in Saurashtra and Kutch

Sites to be used for purposes of salt manufacture in Saurashtra State are leased by that State. The following are the important terms of this lease agreement—the terms of ground rent and royalty varying in the case of inland and marine salt works.

For Inland Salt Works:—

- (a) Ground rent at the rate of Rs. 2/- per acre, and
- (b) Royalty at the rate of Re. 0/2/3 per B.Md. of salt manufactured. The rate of royalty has since, however, been reduced to Re. 1 per ton from the 15th June, 1953 at the suggestion of the Government of India. This excludes the Dhrangadhra Chemical Works, Ltd. Dhrangadhra whose case is under consideration with the State Government separately.

For Marine Salt Works:—

- (a) Ground rent at the rate of Rs. 2 per acre, and
- (b) Royalty at the rate of Re. 1 per ton of salt manufactured.

The old salt works, however, continue to function under their own Agreements.

2. The sites are leased for purposes of salt manufacture for a period of 25 years unless there is any breach of any of the conditions of this lease, and both the lessor and the lessee are at liberty to terminate the same on giving a notice in writing at the close of the salt manu facturing season.

3. On the expiry of the lease or its sooner termination the said lands are to be left in such order as is consistent with due performance of this lease with all works erected thereon as they are provided that any machinery or rail sidings may be removed.

4. The lessee will be entitled to such compensation in respect of works as may be determined by the Salt Commissioner.

5. The lessee shall at all times be bound to duly observe and perform the terms and conditions of the licence which may be granted by the Central Government.

6. The lessee shall maintain quarters for Government officers and establishment as may be considered necessary, and necessary repairs etc., connected with the salt manufacture shall be carried out in the works.

7. The lessee cannot assign, underlet or part with the possession of the said lands without the written consent of the Saurashtra Government.

8. No salt which is inferior to the standard laid down by the Government is to be stored.

9. Any amounts under this lease agreement are to be recoverable as arrears of land revenue.

10. The Government shall be entitled to a lien over 25% of the salt produced by the works in the factory.

11. In case of any dispute arising between the works and the Government, the decision of the Salt Commissioner shall be final.

12. This lease is subject to such conditions which may be enforced by Government of India from time to time.

All salt works in existence prior to the constitution of the United States of Saurashtra, however, continue to function under their own terms of Agreement entered into with the respective States, and all salt works leased during the regime of the Saurashtra Government are now being leased under these terms of agreement on the inland and marine sites. All these salt works in Saurashtra have, as a matter of goodwill, agreed to supply salt for local consumption within Saurashtra State at the rate of six annas per B. md. ex-works on permits issued by the Saurashtra Government officers.

The leasing of sites for salt manufacture in Kutch State rests with the Chief Commissioner, and licensing is done by the Salt Commissioner, New Delhi. The Provisional Licence adopted for the salt works in Saurashtra has also been adopted for the salt works in Kutch State and the terms of the lease agreement are practically the same as adopted by the Saurashtra Government for lease of such maritime lands in Saurashtra State; but the following are the rates of ground rent and royalty:—

- (1) Ground rent at eight annas for the first year, Re. 1 for the second year, Rs. 1/8/- for the third year and Rs. 2 for the fourth and subsequent years of production per acre.
- (2) Royalty at the rate of eight annas per ton of salt manufactured from the date of production.

The United Salt Works and Industries, Ltd., Kandla, which existed prior to the formation of Kutch State as Part C State, continue to function under their lease agreement entered into with the then Kutch State, subject to the abrogation of their monopolistic rights with effect from 21st April, 1950. Similarly, The Tata Chemicals Ltd., Mithapur (Amreli District of Bombay State) continue to function under their old terms of lease agreements entered into with the Baroda State, though their monopolistic rights have been terminated by the Bombay Government. Negotiations are, however, afoot to revise the old Agreement.

(ii) *Natural and Climatic Conditions.*—The long coast line of Kathiawar and Kutch is ideally suited for large scale salt manufacture in India. The littoral is the most favourable site on account of high winds, good tidal rise, comparatively high temperatures, good density and purity of sea brine, low rainfall and reasonably good transport facilities for the export of salt by sea. The saline and clayey tracts lying on the edges of the creeks have mostly got impervious beds and natural contour levels fit for locating salt works. On an average, this coast affords 300 days in a year for manufacture of salt. Whereas climatic conditions vary from year to year, the following meteorological data collected at Mithapur for the year 1951 should

afford an useful idea of the climatic conditions obtained on this coast. Mithapur is on the north-western corner of Kathiawar and these data can fairly represent the climatic conditions on the coast line of Kathiawar and Kutch. The rainfall, however, varies from about 5" to 20" in a year, but is entirely concentrated in the monsoon months.

Month (1951)	Maximum Temperature	Minimum Temperature	Relative Humidity %	Rainfall (inches)	Rate of evaporation	Wind Velocity (mph)
1	2	3	4	5	6	7
January . .	75.4	60.3	55.5	..	0.26	6.8
February . .	92.1	62.4	46.0	..	0.21	5.1
March . .	86.7	69.3	59.6	..	0.13	6.5
April . .	88.4	75.1	65.8	..	0.17	9.2
May . .	92.1	79.0	69.9	..	0.15	8.9
June . .	94.5	82.6	68.9	0.15	0.12	11.6
July . .	92.7	81.0	70.9	4.6	0.14	12.0
August . .	89.4	78.9	76.4	1.55	0.12	11.2
September . .	90.4	77.0	70.3	0.25	0.23	7.5
October . .	87.5	75.6	70.0	..	0.23	8.0
November . .	87.7	71.0	63.7	..	0.26	6.4
December . .	81.0	64.5	66.2	..	0.21	5.1

*An unusual cyclone brought about 8" sudden rainfall, and has not been shown here.

(iii) *System of Manufacture and Storage.*—In marine salt works in Kathiawar and Kutch, salt is manufactured by solar evaporation and the process followed is the same as is followed in other countries i.e., Aden and Middle East. All the works have been located at such suitable saline sites where natural advantage in the way of catchment of sea brine during high tides has been obtained. Sluice gates, automatic or manually worked, are installed at suitable points from where sea brine, during high tides, flows to the catchment areas—the same having been properly segregated by making protective embankments all round equm. Automatic gates get opened automatically to admit the sea brine during high tides when it rushes into the catchment area and get closed when the tidal action is over and the brine starts receding towards the sea. The fixed gates have to be worked by workers who, knowing the times of the tidal actions, adjust these gates in such a way that the brine is allowed to get into the catchment area during tides, and as soon as the recession starts, the same are closed down. This fresh brine varies in density from 3° to 3.5° Be. depending upon the season of intake and other local conditions like the flowing in of sweet water rivers into the sea in the vicinity of the gates.

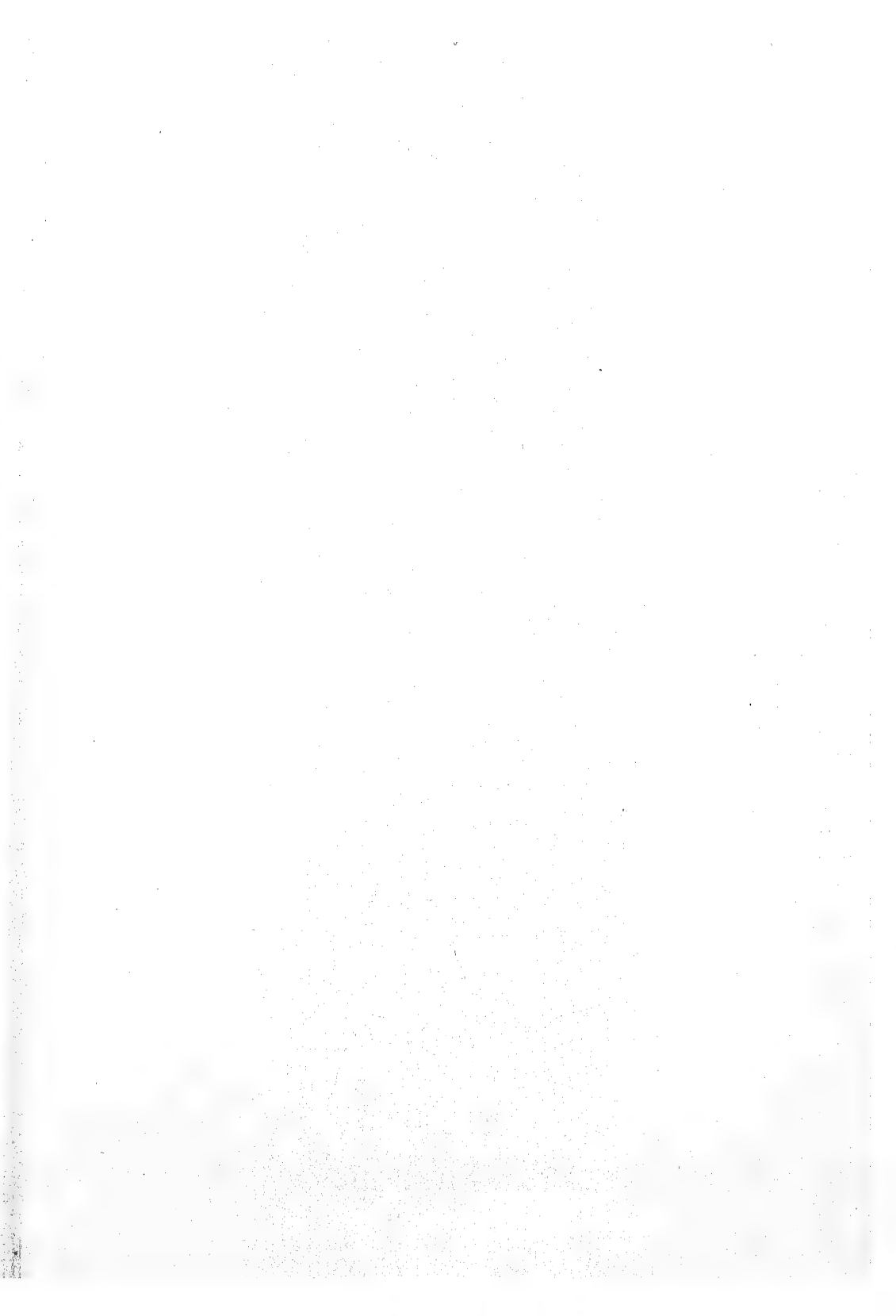
All the works are constructed at such sites and in such a design that their natural contour levels are put to maximum utility inasmuch as gravity

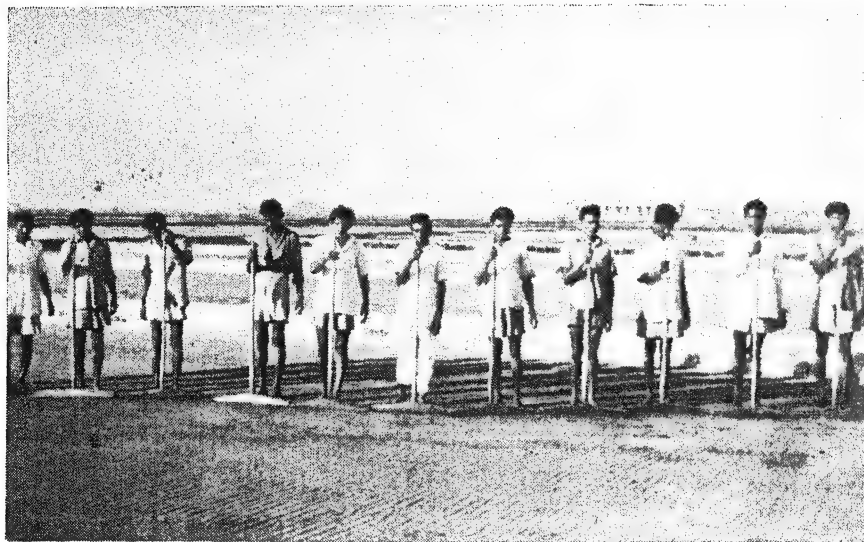
flow of the brine from the catchment area to the condensers can be obtained as far as possible, and the crystallising pans are constructed at such suitable places, from where the mother liquor or the bitters after a crop can be drained off expeditiously before fresh brine is charged in for the next crop. The brine thus caught in the catchment area is allowed to flow by gravity flow as far as possible to sets of condensers which are interconnected by sluice gates to control the movement of brine. In cases, where contour levels do not permit such gravity flow, this brine has to be lifted with the help of pumps and discharged into the series of condensers for its concentration. Since the catchment area has to be emptied out for taking in fresh brine during the next high tide, which occurs after a lapse of about two weeks, all the brine caught in the previous tide has to be moved on to the condensers in good time to permit the catchment area to catch brine during the following tide. The condensers are usually constructed in series in order that the brine can continue to flow by gravity from the first to the last condenser slowly so as to attain the maximum rate of evaporation to raise its density to about 22° to 23° Be. before it reaches the final charging drain which feeds the crystallising pans. In salt works, where brine has to be lifted up from the catchment area to the condensers, it flows by gravity up to the charging drain and through it to the connected crystallising pans. In works where brine can flow by gravity from the catchment area to some of the condensers, the same has to be lifted up to increase its lift to make it flow to the next condensers. In about ten days' time, when the brine is being removed from the catchment area itself, it usually rises in salinity to about 6° to 7° Be. depending upon the weather conditions, and its flow through the series of condensers is always regulated in such a way that the brine of the same density flows more or less through the same condensers. This flow of brine through the condensers ultimately results in increase in its density to about 22° to 23° Be. The proportion of catchment-cum-condenser's areas to crystallisers' varies, but on an average it works out to about 6:1.

By the time the density of brine has risen to about 10° Be. the original volume as taken in the catchment area gets reduced to about 37% and most of the calcium carbonate that is present in sea brine gets precipitated by this rise in density. In condensers where its density gets to about 17° Be. the original volume gets reduced to about 25% and most of the remaining calcium carbonate is also precipitated out completely. At this stage calcium sulphate in the form of gypsum begins to separate and by the time the density reaches 22 to 23° Be. about 85% of the gypsum present in the sea water is thrown out of the brine. The remaining about 15% of gypsum continues to remain in the brine. At this stage the volume of sea brine gets reduced to about 10% of its original volume. Since the separation of calcium carbonate and gypsum takes place within certain ranges of density, the flow of the brine through the condensers is always controlled in such a way that the brine at different densities flows through the same condensers in order that the calcium carbonate and gypsum get separated in the same condensers in the same season.

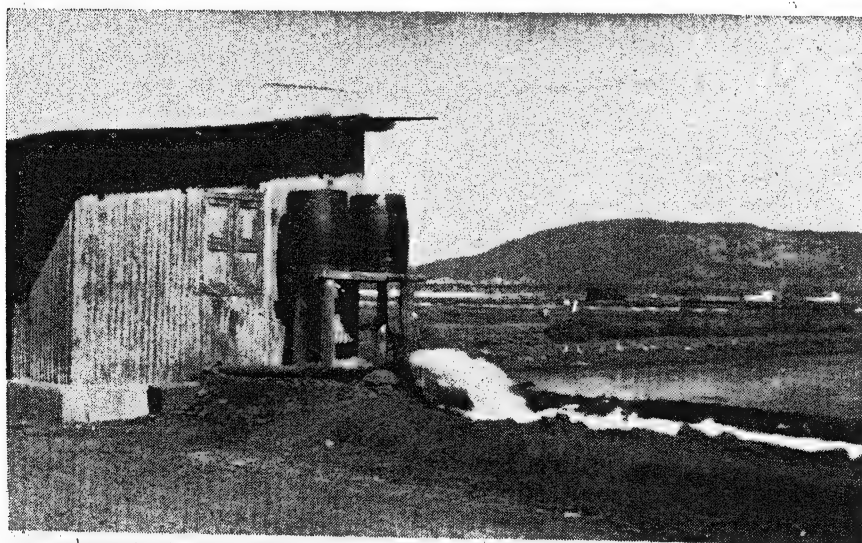
The works which are recovering gypsum from their condensers regulate the flow of brine in the condensers in such a way that the recovery of gypsum is facilitated by getting it deposited in certain fixed condensers.

The crystallising pans are, soon after the monsoons every year, properly repaired along with other repair works to be done in the works, and their beds are particularly made impervious by tamping and puddling in order to check seepage of brine and contamination of the salt crystals





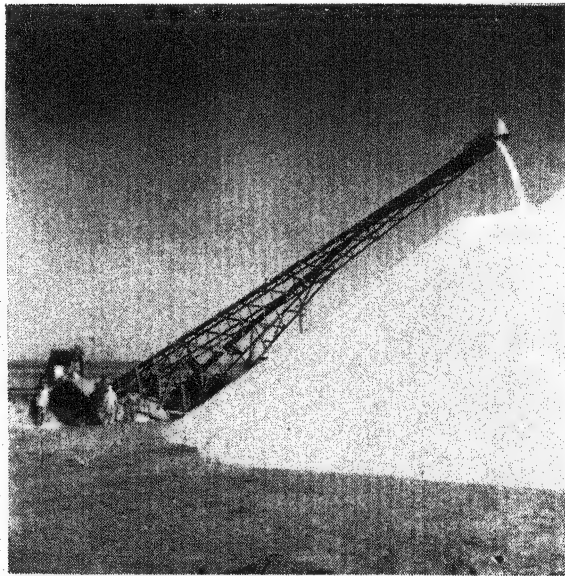
Ramming of crystallizers beds



Pumping station



Stacking of crushed salt



Stacking by belt conveyors

during harvesting. This brine, by the time it reaches the main feeder channel, attains a density of 22 to 23° Be. and is fed by installing, if necessary, a pump to the crystallising pans, whose sizes vary from about 200' × 80' to 300' × 100', with depths varying from 1' to 1 1/2'. Brine at a density of about 24° Be. is then pumped into these pans and salt is allowed to crystallise out. By the time the density of the brine rises to about 28.5° Be., about 75% of the salt present in the brine gets separated and at this stage, such pans are replenished with a further supply of concentrated brine of about 24° Be. and the crust forming on the bed is allowed to grow till it attains a thickness of about 2". This thickness is attained in about 15 to 30 days depending upon the seasonal conditions governing the evaporation of brine. The crystallisation operations in the different pans in a works are regulated in such a way that the collection of salt, once it is started, can be continued throughout the production period, which usually starts from November or December depending upon the availability of concentrated brine. With the desired thickness of crust of salt obtained in a pan, the density of the mother liquor is allowed to go to about 29.5° Be. to permit the separation of the maximum quantity of good quality salt from the same. The mother liquor is then drained out through the discharging drains which are always constructed at a lower level than beds of the crystallising pans, and the same is drained out and thrown into the open sea at such a point from where it does not find its way back into the catchment area, unless, of course, the bitterns are to be preserved for recovery of by-products from the same. In some works, at this stage, fresh brine of a density of about 20° Be. is admitted to such a pan from where mother liquor has been drained out and the collection of salt is done with this fresh brine in order that the salt crystals heaped up get washed of their physical and chemical impurities in this fresh brine. In others, the mother liquor is not drained to the last drop, and about 1" layer is allowed to be kept on the crust and the salt is washed and heaped up in this liquor. The salt crust after its proper washing, is heaped up in the form of heaplets in the pans, dried and loaded direct into the tipping wagons for transportation to the crushing mills or the storage platforms at the jetty sidings, as required. The traction of these tip wagons is usually done by diesel locomotives. The bitterns from all such pans from where crust has been removed are drained out and the pans are re-charged with fresh brine for the next crop of salt and this process is repeated till the break of the monsoon in June or July every year. Some of the works are, however, changing this practice and are trying to continue their production operations till they are forced to stop by concentrated showers of rainfall. Usually in a season about five to six crops are obtained and the salt is not allowed to be stored on the edges of the crystallising pans and is always actually removed to the storage platforms which are always constructed at a higher level to avoid their washing away during monsoon or in flood waters. These heaps are always kept in the open and a single heap may contain about two to ten lakh maunds of salt. These heaps are usually made with the help of movable stackers which receive salt direct from the tipping wagons.

Most of the works have installed crushing mills in their works where salt is crushed to a fine grain, as Calcutta market demands finely crushed salt. Crushing mills are fed with bucket or belt endless conveyors, and the crushed salt finds its way out in elevated belt conveyors, where by crushed salt is heaped up in regular heaps on platforms. These crushing mills in all the works are worked with high power diesel engines which are specially installed for this purpose.

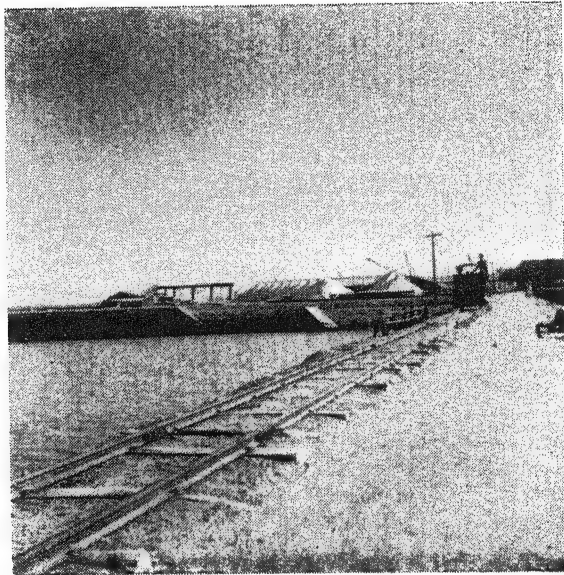
Most of the works are situated on the edges of creeks and they have built their jetty sidings on the same, from where barges are loaded with salt for its loading into the steamer holds. The anchorage of the steamer varies from port to port, the usual lead being about two to five miles, excepting at Mithapur and Bhavnagar where steamers anchor along the port wharfs. The salt works at Lavanpur are, however, situated far off from the port heads and salt has actually to be transported in railway wagons from the works to the jetty sidings. The shipping facilities like barges and tugs etc. are obtained from the ports on hire basis, and only the works at Jafrabad own their such resources.

(iv) *Quality*.—This salt when crushed is absolutely white in colour and compares very favourably indeed with the best imported fine salt into Calcutta market in respect of both its physical and chemical purities. The average and maximum chemical composition of this salt are given below:—

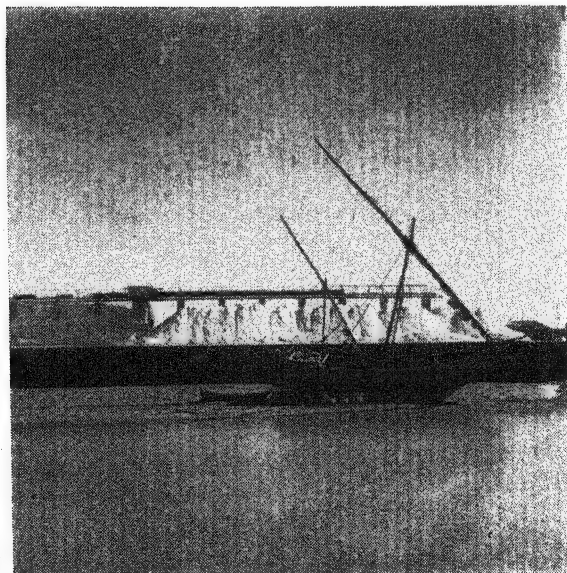
	Maximum purity	Average purity
	%	%
Sodium chloride	98.60	95.81
Calcium sulphate	0.59	0.67
Magnesium sulphate	0.08	1.41
Magnesium chloride	0.15	1.81
Insolubles	0.14	0.11
Undetermined.	0.44	0.19
	100.00	100.00
Moisture	0.70	0.70

(v) *Production and Exports*.—All the salt manufactured in the marine salt works on this coast is meant for export to Calcutta (and foreign countries) except for about 18,00,000 maunds which is annually used for industrial purposes in the Chemical Works of The Tatas at Mithapur, who also export surplus to Calcutta etc. The local issues for alimentary purposes are insignificant. The production of salt obtained in all the marine salt works since 1946, along with exports to Calcutta during these years is given below:—

Year	Production	Exports to Calcutta
	(B. Mds.)	(B. Mds.)
1946	54,69,000	1,26,00,000
1947	73,71,000	59,00,000
1948	96,19,000	47,54,000
1949	1,14,11,000	95,32,000
1950	1,44,10,000	80,60,000
1951	1,67,17,000	1,14,36,000
1952	2,07,78,000	1,04,62,000
1953	2,05,36,000	95,22,000
1954	2,02,40,000	98,02,000
1955	2,84,75,000	1,04,78,000



Removal of salt to jetties



Loading of salt into barges

During 1954, besides supply to Calcutta, 1,98,000 Mds. of salt moved to Cochin for a Chemical Factory and 4,20,000 Mds. to Mithapur Chemical Works, for heavy chemical industry. Besides 22,000 maunds moved to Bombay State by sea and 15,55,000 maunds to U. P., Bihar, Assam, West Bengal, Punjab, etc. by rail routes. During 1955, also a certain movement of salt took place besides supply to Calcutta by sea. With such phenomenal increase, these exports have completely wiped out the imports of salt into India and the production being more than requirements, the same is now being exported to foreign countries also since 1950—Japan being the most active market at present. Exports to Japan since 1951 are given below:—

Year	Quantity (in thousand B. Mds.)
1951	4,71
1952	66,15
1953	68,03
1954	53,82 (including 14,000 Mds. to Okinawa, U.S.A. occupied area)
1955	29,01

(vi) *Cost of Production.*—The cost of production of salt has appreciably increased during recent years with the alround increase in the cost of machinery, materials and labour charges. The price in the larger works varies from Re. 0/7/7 to Re. 0/10/10 per maund. The factors governing the cost of production are; cost of brine, labour, power and fuel, maintenance, miscellaneous and interest charges, supervision and overheads, rents, rates and taxes, washing charges, crushing charges, depreciation, etc.

(vii) *Sales.*—Salt is usually sold on f. o. b. basis and the transactions are done in terms of tons. These rates have varied from about Rs. 5 to Rs. 60 per ton during the last 15 years, and the present rates are Rs. 15 to Rs. 17 for crushed salt and Rs. 14 to Rs. 16 for uncrushed salt depending upon its quality and the reputation of the works concerned. Both crushed and uncrushed salts are sent to Calcutta.

The export to Calcutta is mostly done in chartered steamers and the following are the present charter party terms agreed to between the Indian Salt Manufacturers' Association, Bombay, on behalf of the marine salt works, and the Indian Coastal Conference, which consists of about 14 members.

Salt on Charter Party:—

From Saurashtra and Kutch Ports and Okha to Calcutta.

(a) Rate : Rs. 31/4/- net per ton of 28 B. mds.

(b) Loading and Discharging: 1,000 tons per weather working day time to be non-reversible.

Demurrage: Rs. 3,000/-

Despatch : Rs. 1,500/-

(c) Payment of Freight: Payment of 95% of the freight on the signing of the Bills of lading and 5% to be adjusted along with disbursement account. Bills of lading will have to be taken away by the Charterers and/or the sub-charterers, as the case may be, within say, 72 hours of the ship.

(d) Notice of Readiness: to be served either by the Captain or by the Agents between 10 a.m. and 4 p.m. on week days and between 10 a.m. and 1 p.m. on Saturdays at loading and discharging ports.

Sales for exports to Japan are made on f.o.b. basis under Charter Party terms as agreed to, the daily rate at present being 750 tons. The current rate is about Rs. 15 per ton f.o.b. for uncrushed salt. Japan imports only this variety of salt.

This salt can move by rail to the consuming areas under 'ordinary traffic' only. From the 1st January, 53, however, salt produced at Kandla has been permitted to move under 'preferential traffic' at the instance of the Railway Board to utilise empty available wagons on the new Kandla-Deesa link. Six districts of Uttar Pradesh have been allotted to this source to despatch about 6 wagons a day.

(viii) *Small Scale Manufacture of Salt.*—The manufacture of salt on small scale has been known to have been carried on along the coastal line of Kathiawar and Kutch from times immemorial, and this industry continues to flourish till today, though on a much restricted scale, and the establishment of major salt works on the coast line has affected the activities of the small scale manufacturers in no small measure. In the nineteenth century and before, this coast line had many small scale manufacturers who were supplying their salt not only to the local populace by road, but were exporting their salt by sea to even foreign countries. With the adoption of the new excise policy by the then British Government, their activities came to be very much restricted, and since about 1885 they produced only as much salt as could be consumed locally. With the abolition of the excise duty on salt and the change of the Government policies in this respect, this small scale industry soon showed signs of revival, but it cannot be expected to compete with the large scale salt works constructed on modern lines, where cost of production is much lower and quality of salt produced definitely better.

This small scale industry now functions under the concessions afforded in the Government of India Press Communique dated the 23rd April, 1948, and exists only on the southern coast of Saurashtra and on the western coast of Kutch State. The following are the important places in Kathiawar and Kutch, where this manufacture is being carried on at present:—

Kathiawar:—Bhavnagar, Bherai, Kathiawadar, Mahuva, Sathara, Tarsana, Padri, Methala, Sarthanpur, Mitiala, Bela, Porbandar, Lodhwa, Senjalie and Hadiana.

Kutch:—Padana, Gundiala, Makkan, Sindhori, Sainro (Narayan-sarovar) and Lakhpat.

Bombay:—Kodinar.

The total acreage under salt cultivation in Kathiawar and Kutch is 260 acres in 21 units, employing about 600 families and producing about 4,50,000 maunds of salt. In almost all these works salt is manufactured from the sub-soil brine drawn out manually from shallow pits dug out on the sea coast.

The depth of these pits varies from about 4' to 12' and the density of the brine varies from 8 to 20° Be. Alongside these pits small pans measuring about 6' x 10' with a depth of about 9" are used as crystallisers. Sometimes similar condensing pans are also attached to these crystallisers where fresh brine is condensed to a higher degree before crystallising pans are charged with the same. Single irrigation system is followed for the production of salt and about 5 to 10 crops are taken every year. Though the method followed is crude and no scientific control of any kind is maintained, yet the average chemical composition of such salt is not bad and is above 94% sodium chloride.

More than half of this produce is consumed locally within a radius of about 40 to 50 miles, and the remaining finds its way to minor ports in Bombay State and sometimes to Malabar coast by sea. The export of this salt to Bombay proper and in consignments of more than 30 tons each to the minor ports of Bombay State was restricted by the Government of India till 1952, but all such restrictions have since been withdrawn and this salt can now move freely by sea to any port in India.

Though no control is exercised on the maximum selling prices of such salt, the prices usually vary between four to eight annas per B. Md. ex-works, and half of Kathiawar and the whole of Kutch State normally receive their salt supplies from such manufactories. Efforts were made in 1951 by the Saurashtra Government to form Co-operative societies out of the agarias working in such units with a view to improve the quality of salt manufactured and to have a better system of sales of salt to place this cottage industry on a stable footing. In some cases, advances had also been given to the agarias to enable them to extend their activities to produce more salt. These agarias are poor and illiterate people who do this job in addition to their main occupation of agriculture. The holdings of an average agaria family is about half an acre.

(ix) *Various Committees and their Recommendations.*—Since the advent of the Salt Excise Policy of the British Government and the suppression of salt manufacture in the Indian States, particularly in the Kathiawar and Kutch States, the Indian Taxation Enquiry Committee in about 1926 stressed for the first time the necessity of a well developed salt industry in India for her economic advance and suggested that it was desirable indeed to make India self-sufficient in the matter of her salt supplies. This resulted in an enquiry by the Indian Tariff Board in 1929-30. At about the same time, the Indian States Enquiry Committee remarked that in a Federal India, States owning valuable salt sources should be treated not as possessing potentialities of danger and injury to salt revenues but as capable of making a helpful contribution to the efficient and economical supply of salt to India as a whole, and referred in particular to the very special grievance of the Dhrangadhra State arising out of the complicated history of its negotiations with the Government of India from about 1915 to 1923-24. The reports made by the Indian Tariff Board and the Salt Survey Committee, which was appointed in 1930 on the recommendations of the Board, ultimately led to the protection that was then granted to the indigenous coastal salt industry in India, and the Salt (Additional Import Duty) Act of 1931 was passed. This protection continued at varying rates till 1939 and helped immensely to protect the industry on the West Coast and actually resulted in the opening of more salt works on this coast. World War II, with the consequent shipping difficulties that it created and the reduction in the volume of imports of foreign salt, helped to stabilise this industry to a

great extent, and about half a dozen salt works came into being. The Salt Survey Committee had come to the conclusion that Western Coast possessed potentialities of producing fine grained salt required for Calcutta market.

With the abolition of excise duty on salt from 1-4-1947 and the advent of Independence from 15th August, 1947, salt industry started receiving greater attention at the hands of the National Government and, just before the excise duty was abolished, Shri Shiv Charan Das was placed as an Officer on Special Duty for salt with the Central Board of Revenue to survey the existing and potential capacities of all the salt works in India and to suggest the future pattern of the development of this industry. His survey referring to the then existing salt works in Kathiawar and Kutch included the production capacities of those works, and he also estimated their potential capacities after further developments. His surveys are tabulated below:

(Figures in '000 B. mds.)

Source	Average Production during 5 pre-war years	Average Production during 5 war years	Potential Production after 2-3 years' de- velopment	Potential Production after further 5 years' de- velopment
1	2	3	4	5
Kathiawar and Kutch	61,27	81,00	1,00,00	1,50,00

(These figures include both the inland and maritime salt sources.)

Soon after, with the formation of the United States of Saurashtra in 1948 in which all the maritime and inland States of Kathiawar (excluding the Baroda possessions) were integrated, all the salt works came under the administrative control of the Saurashtra Government. The Saurashtra Government, realising the extreme necessity of developing this industry further on this coast, at the instance of the Central Government, constituted a Salt Experts Committee in October, 1949 to assess the possibilities of the development of salt industry on the coastal line of Saurashtra and to suggest suitable sites with a view to locate salt works there. The Committee submitted their report in April, 1950 to the Saurashtra Government. They suggested 12 places where, according to them it was economically possible to start salt works. This they did after studying the local conditions and the nature of the soils and other physical factors. Against each site, they recorded the estimated production which could be expected from it. The following statement indicates the names of the sites, their estimated acreage and production in tons as reported by them:

Name of Place	Estimated area in acres	Estimated Production in tons
Port Victor	2,000	60,000
Jafrabad	750	25,000
Sarmat	800	25,000

Name of Place	Estimated area in acres	Estimated Production in tons
Bhavnagar (2 sites)	1,800	54,000
Chanch	500	10,000
Sikka	650	20,000
Jodiya	1,200	36,000
Nagna	1,000	30,000
Singach	850	30,000
Bherai	700	15,000
Lodhwa	1,000	20,000
Hadiana	150	5,000
TOTAL	11,400	3,30,000

In addition they suggested about 11 sites which, according to them, were not fit for locating major salt works. These sites were at Chhaya, Cossalbara, Navibunder, Madhavpur, Mangrol, Shil, Miani, Lamba, Gurgha, Sanjalja and Mahuva.

In working out the estimated production of salt at sites where, according to them, major salt works could be located, the Committee assumed the production of 30 tons per acre of area under commission. This production capacity, is much below average that is already being obtained at the existing salt works on this coast. Out of the sites recommended by the Committee, construction of salt works was sanctioned by the Government of India at Port Victor, Bhavnagar (extension), Jodia, Nagna and Bherai (extension), though so far sites at Port Victor and Jodia have not been developed. Sites at Jafrabad and Sikka were not considered quite suitable for locating major salt works, and no application for licensing and/or leasing have so far been received for sites at Chanch, Singach, Lodhwa and Hadiana. The site at Sarmat, though sanctioned by the Government of India for licensing purposes, could not be leased by the Saurashtra Government since the same was taken over by the Indian Air Force in connection with the development of the aerodrome at Jamnagar. This Committee's report did not cover the inland areas where salt industry could be developed and also excluded the coastal line on the North-East of Saurashtra in the vicinity of Navlakhi Port, as the members were not able to visit that site. This report was, however, confined only to the selection of sites and did not consider the economics of the salt industry and other allied matters.

In 1952-53 the Saurashtra Government appointed another Salt Experts Committee to investigate and report on the development of the Salt Industry in the State. They submitted their report in 1953 to the Government of Saurashtra which is under their consideration.

In 1952 the Saurashtra Government appointed another Committee known as, "The Saurashtra Salt Works Labour Enquiry Committee". They

examined the working conditions of Labour on Salt and submitted their report in the year 1955. Their main recommendations have been given in the Chapter dealing with "Labour in Salt Industry".

At about the same time in 1949, departmental enquiries were made by the Salt Commissioner, New Delhi, through a Superintendent of the Bombay Salt Region into the possibilities of development of this industry in Kutch State. This officer surveyed the Kutch coast and the Rann of Kutch lying on the north and north-east of the State and submitted his report in July, 1949. This report suggested possibilities of opening major salt works on the coast line at Mundra, Mudawah, Moti Sindhori, Padana and Koteswar. It also drew attention to the natural deposits, running into an area of about 300 sq. miles and assuming the average thickness to be about 3" at about 4,66,71,428 tons (126,01,28,556 B. mds.) and also mentioned about the formidable difficulties which have to be faced in exploiting these deposits due to the total lack of any kind of transport means in this area. Out of these coastal sites, Mundra and Narayansarovar (Koteswar Port) have already been licensed and salt works have been set up there. Moti Sindhori, which was first licensed had to be abandoned and the site shifted near Jakhau port at a distance of about 12 miles from the former. These salt works have also been started. However applications were received for two other sites at Tuna Bunder and Saithsaiida Bet opposite Kandla Port, but since the sites are included in the "frozen area" for purposes of development of the Kandla Port into a major port, the same cannot be leased and licensed until they are released by the Development Commissioner, Kandla Port. This report enabled the Central and local Governments to know the possible sites for purposes of development of the salt industry in this area.

In 1951, the Geological Survey of India, deputed a geologist to survey and report on the existence of salt (and gypsum) in the Kutch State, particularly in the Rann of Kutch. This report was published in April, 1953 and it only confirmed the earlier findings already with the governments.

Salt Experts Committee

In April, 1948 the Salt Experts Committee appointed by the Government of India visited some of the salt works on this coast and made certain important recommendations about them in their final report submitted in April, 1950. The following are the important observations made by them with regard to the coastal works:—

(1) The development of the Salt industry on the coast line in Kathiawar and Kutch is due to the initiative and enterprise of the late Mr. Kapilram H. Vakil, who met with considerable difficulties in the initial stages in establishing his first salt works at Mithapur in 1927 against competition from imported salt.

(2) Some of the salt works in the different States on this coast continue to function under monopolistic rights that they obtained from the previous States. It is considered very desirable that all such monopolistic rights should be reconsidered and abrogated.

(3) Both Kathiawar and Kutch are ideally suited for manufacture of solar salt because of low rainfall, long periods of dry weather, high winds and fairly high temperatures, together with the availability of sea brine of uniform salinity throughout the year. The technique of salt manufacture on this coast is well developed and the salt produced is of a uniformly

better quality than that produced in the marine salt works in Bombay, Madras, Travancore and Orissa. But, in some cases, the areas are not properly regulated as between reservoirs and crystallisers, and a ratio of 1:5 or 1:6 as for crystallisers and reservoir-cum-condensers has been recommended. This proportion should yield a production of about 80 tons per acre.

(4) The practice followed at Lavanpur of mixing bitters with fresh brine with a view to raise its density is unscientific, and should be stopped.

(5) The Salt works at Kandla are well laid out and in many respects can be looked upon as a model and may well be copied by the salt works in the adjacent peninsula of Kathiawar and also by manufacturers in Bombay, Madras, Travancore and Orissa. These works have an ambitious development programme in hand, but they have not been able to make any progress because of the development of Kandla Port into a major Port. The Government of India and the Kandla Salt works should get together and arrive at a solution which should enable the salt works to continue and the port to develop.

(6) In view of the importance of gypsum in the fertiliser and cement industries, its recovery should be made a regular practice in all the works on this coast.

(7) The sodium chloride content in the salt manufactured on this coast varies from 96.68 to 98.74% and with the closer scientific control on the manufacturing operations, all the salt works can produce their salt containing above 98% sodium chloride. The major works should start laboratories and engage scientific workers to control the quality.

(8) The manufacturing operations should be continued until monsoon actually breaks and even then the works should not stop altogether unless the rainfall is too heavy.

(9) The development of new salt works at Varsamedi by The Maharaja Salt Works Co., Ltd., Lavanpur has not been a success and the same should be opened on the site between Lavanpur and Navlakhi port which should prove a much better site than Varsamedi.

(10) Velan, a small port situated on the southern coast of Kathiawar in Kodinar taluka, is not fit for starting a major salt works there due to transport and shipping difficulties.

(11) The salt works at Jafrabad should not be developed further till adequate transport arrangements are available for shipping their produce.

(12) Kathiawar and Kutch works alone with (a) extension of the manufacturing season, (b) expansion of some of the salt works, and (c) advent of new salt works, can set right the deficit in the country within a period of three years. However, concentration of production of salt in any particular area in Kathiawar and Kutch should be avoided, and the extension of the salt industry on an all-India basis should be planned carefully. Also the new salt works to be started in this area should not be allowed to be concentrated at a particular place which might create shortage of trained labour and transport difficulties.

(13) In addition to the establishment of a chemical laboratory at each works, the works should employ a civil engineer and also an electrical and mechanical engineer so that the works and the equipment can be better maintained than is being done at present.

(14) World War II gave the salt industry an opportunity to consolidate its position and in spite of rising costs of manufacture, it has realised high attractive prices in the Calcutta market, and the industry is today in a position to stand foreign competition without tariff protection.

(15) The manufacturers' prices ex-works or f.o.b. port of despatch should be examined with a view to reduce the same and the shipping freight charges from this coast to Calcutta need also to be reduced substantially in order to reduce the price of salt for Bengal.

(16) The movement of salt from this area to Bombay by sea should not be allowed.

(17) The recovery of by-products from bitters both from inland and coastal salt works, has so far been attracting little attention in India and all the major salt works should take part in recovering by-products earnestly. Mithapur is the only place where the major components of sea brine are being recovered in a systematic way, but their figures of recovery of the different chemicals reveal that there is no relationship between the production of salt and that of the various by-products. Mithapur works should try to attain more rational recovery ratio between common salt and by-products. Also the existing area under bitters pans at Mithapur should be divided into two compartments the first to be used for raising the density to 32° Be', for recovery of crude salt, and the second for raising the density from 32° Be' to 34° Be'.

(18) Against the present annual yield per acre of 37 tons of salt, the potential capacity is 80 tons per acre and the potential production from these works should be 1,77,00,000 maunds considering only the works actually in production and for which areas have been allotted already. This figure does not take into account the vast potentialities that exist for the new salt works in this area. The works already under commission are capable of producing 1,40,19,000 maunds of salt by 1955-56.

(19) In the revised set up of the Salt administration in India, Kathiawar and Kutch States should be under the charge of an Assistant Salt Commissioner, with headquarters at Rajkot, assisted by three Circle Officers, one for Kutch and North coast of Kathiawar, one for South-West coast of Kathiawar and one for the headquarters at Rajkot.

Recommendations accepted by the Government of India

The following particular recommendations have been accepted by the Government of India and the salt works concerned have been advised accordingly :

(1) To relay the Kathiawar and Kutch Works revising the ratio between the condensers and the crystallisers on a scientific basis.

(2) To instal an analytical laboratory in each of the large salt works in this area for quality control.

(3) To employ Civil and Mechanical Engineer and Chemists for controlling manufacturing operations in large salt works.

(4) To establish control laboratories in the larger salt works.

(5) To introduce labour saving devices into the large factories.

(6) To recover magnesium sulphate from the bitters of all the larger salt works in order to meet the entire demand of the country for this chemical.

(7) The recovery of gypsum should be made a regular feature in the process of salt manufacture in all the major salt works of the country.

(8) To reduce the number of labourers in all the salt works in order to reduce the cost of production and to induce the labourers to stay permanently in the salt works instead of their dispersal during the rainy season by finding alternative employment for them.

(9) To advise Jafraabad salt works not to expand the factory further without making better arrangements for transport.

(10) To divide the existing area under bitterns pans of Mithapur works into two compartments in order to utilise the first one for raising the density up to 32° Be. From the second crop obtained from 32-34° Be. appreciable quantity of magnesium sulphate could be recovered.

(11) To rationalise the production of by-products from bitterns according to demand.

(12) To advise Kandla Salt Works to commence manufacture of salt with 2° Be. instead of waiting for the density to rise to 3° Be.

(x) *Existing Salt Works and their particulars.*—The table on the next page indicates the existing licensed maritime salt works in Saurashtra and Kutch States and Amreli District of Bombay State.

The works sanctioned during and after 1950 function under the new lease agreements of the States concerned; but those already in existence prior to the formation of Part B and C States continue to function under their old terms of lease agreements. All were licensed from the 1st April, 1950.

Particulars of their history, situation and layout and production etc. are given in the following pages, the works having been dealt with in order of their dates of commencement. (Efforts were made to collect correct details as far as possible; but still the possibility of certain incorrect data having been incorporated cannot be ruled out.)

(1) *The Tata Chemicals Limited, Mithapur*

History.—These salt works, originally known as "The Okha Salt Works, Ltd.", came into being in May, 1927, when the late Mr. Kapilram H. Vakil made certain proposals to the Baroda State in 1924-25 for the grant to him of tracts in Okhamandal sub-division of the Baroda State and certain rights and privileges and concessions for the collection of raw salt and brine for the manufacture of salt for local consumption and for use in the heavy chemical industries as also for its export to Bengal and foreign countries. These works were formally opened by Mr. V. T. Krishnamachari, the then Dewan of Baroda State, in 1927, and the Agreement incorporating the grant of the monopolies, concessions, rights, privileges, etc. and the terms of rents and royalties was made in December, 1928. Mr. Vakil had transferred all his such monopolistic rights and privileges to the Okha Salt Works, Ltd., which was floated as a public limited company. With a view, however, to start the production of Soda Ash at Mithapur, along with the recovery of by-products from bitterns, which was being done since 1931, and, as a result of negotiations beginning in 1936-37 between the works, the Baroda State and The Tata Sons, Ltd., The Okha Salt Works, Ltd. were taken over in 1939 by the Tata Chemicals Limited, which was then floated as a public limited company, with Mr. Vakil as the Technical Director. Tata Industries, Ltd., are the present Managing Agents of the Tata Chemicals Ltd. This change-over in 1939 took place with

List of Maritime Salt works in Kathiawar and Kutch State

Serial number	Name of the Salt Works	Location	Year of Commencement	Acreage licensed	Average Production ('000 B. Mds.)	Remarks
1.	The Tata Chemicals Limited	Mithapur, District Amreli	1927	975	2,746	
2.	The Maharaja Salt Works Company Limited	Lavanpur, District Madhya Saurashtra.	1929 & 1948	2,627 (Two units)	2,253	
3.	The Saurashtra Salt Manufacturing Company	Porbandar, District Sorath	1931	1,400	2,256	
4.	The United Salt Works and Industries Limited	Kandla, Kutch State	1934	2,900	3,145	
5.	The Digvijaysinhji Salt Works Limited	Jamnagar, District Halar	1936	986	1,550	
6.	The Bhavnagar Salt and Industrial Works Ltd.	Bhavnagar, (Gohilwad)	1943	5,626	2,753	
7.	The Junagadh Salt and Allied Chemical Works	Bherai, (Gohilwad)	1944	1,362	258	
8.	The Kathiawar Industries Limited	Jafrabad, (Gohilwad)	1944	3,349	1,796	
9.	The Halar Salt and Chemical Works	Jamnagar, (Halar)	1948	2,000	2,047	
10.	The Maliya Salt Works	Maliya, (M. Saurashtra)	1948	287	540	
11.	The Navanagar Salt and Chemical Industries	Salaya, (Halar)	1948	1,215	502	
12.	The Jaylaxmi Salt Works Limited	Jamnagar, (Halar)	1950	1,400	1,410	
13.	The Kutchvijay Minerals Company	Narainsarovar, (Kutch)	1950	1,206	61	
14.	The Saurashtra Chemical Company	Mangrol, (Sorath)	1951	50	..	
15.	The Kutch Salt and Allied Industries Ltd.	Jakhau, (Kutch State)	1951	2,614	435	
16.	The Bharat Salt and Chemical Industries Ltd.	Mundra, (Kutch State)	1951	2,488	112	
17.	The Salt and Allied Industries Limited	Jamnagar, (Halar)	1951	1,800	1,061	
18.	The Navanagar Salt and Chemical Industries	Jodiya, (Halar).	Not yet started.	1,200	..	
19.	The Prabhat Salt Works	Jhinjhuda, (Halar)	1951	353	..	
20.	The Gohilwad Salt and Chemical Works Ltd.	Ghogho, (Amreli)	1953	..	..

all the monopolistic rights and concessions granted by the Baroda State, and a formal agreement to this effect was executed in March, 1944, between the State and the Tata Chemicals, Ltd. and this Agreement also contains such conditions and modifications to the original Agreement of 1928, as had been granted by the State since then. The following are some of the important terms of this latest Agreement executed in 1944:—

(1) The State granted:

(a) Sole and exclusive right for a period of 99 years to recover and use raw or natural salt, brine, etc. required for the manufacture of salt and marine minerals, and its derivatives and by-products within the Kathiawar possessions.

(b) Sole and exclusive right for a period of 99 years to procure lime stone and other calcareous substances within the Kathiawar possessions. (It excluded any areas of lime stone deposits leased to and in the occupation of the Associated Cement Companies, Ltd.)

(c) Exclusive right for a term of 25 years within the Kathiawar possessions for prospecting licence for heavy chemicals.

(d) Lease of lands for 99 years for location of the salt and chemical works, buildings, machinery, etc. and lease of lime stone deposits and their excavation, and certain rights and privileges for excavating clay, gravel, sand, etc. required for the business of these works.

(2) The works agreed to pay royalties mentioned below on all salt, marine minerals, their derivatives and by-products manufactured and sold by them. Such royalty was to be calculated on the net selling prices of these goods ex-works.

(a) Royalty of $2\frac{1}{2}\%$ on all salt exported from the works.

(b) Royalty of 1% on all other manufactured products. Provided that these royalties were payable after payment in any year of an average dividend of 5% calculated over the whole of the paid-up capital of these works.

(c) A minimum royalty of Rs. 500 per annum from the date they took over possession of the lands as stated in the Agreement.

(3) The State agreed to afford reasonable facilities such as port, railway, roads, bridges, etc., etc. and it guaranteed to the company for a period of 10 years the then existing rates of railway freight on the Baroda State Railway.

(4) For a period of 20 years the works were totally exempted from payment to the State or any provincial, municipal, local or other authorities within the Kathiawar possessions of the State and of any present or future taxes, duties, cess, assessments, fees, outgoings, tools and all other sums of money whatsoever (other than the customs duties for imports and exports levied in accordance with the arrangement with the Government of India, and port charges).

In the beginning, the works had started experimental works at Okhamadhi also, a place about 25 miles to the south of Mithapur, and this site, if properly developed, was considered capable of yielding about 150,000 tons of salt per year; but this was soon after abandoned in favour of Mithapur, because of its distance from Mithapur and the transport cost involved in the carriage of salt from there to either Mithapur or Port Okha.

These were the first maritime salt works to be started in Kathiawar. Mr. Kapilram H. Vakil, backed by his extensive investigations regarding the possibilities of locating salt works in Bengal, Bihar, Orissa, Dhrangadhra and Hyderabad States and Kathiawar coast, finally selected the present place, where Mithapur is now situated, for locating the first maritime major salt works in India to cut out the imports of foreign salt in this country. He had at that time Aden to compete with primarily, and favourable conditions as obtaining at Aden prompted him to select Mithapur. In fact Mithapur has some better facilities, such as ample room for extension and advantage of Port Okha for issues by sea.

The site at Mithapur, which had certain natural advantages in its contour levels, whereby the sea brine could be taken in by a long circuitous route to the condensers by gravity flow, and the bitterns could easily be collected from the crystallising pans for their subsequent use for the recovery of by-products, satisfied all the usual factors which go to determine the suitability of a place for purposes of starting big salt works and a heavy chemical industry (with the railway and the shipping facilities at Okha Port) was selected for locating the first salt works on this coast. The works were completed by the end of 1929, and in the meanwhile, the first shipment of salt to Calcutta was made in May, 1928 of about 35,000 maunds, which was readily sold in Calcutta.

The Bombay Government, however, in September 1951, abrogated the monopolistic rights of the Tata Chemicals Ltd. as, in their presence, no salt works could be started in the Amreli District. They have represented their case and the matter is now under consideration with the Government of Bombay.

Situation and layout.—Mithapur is situated on the North-West coast of Kathiawar about seven miles south of Okha Port and was a barren and sandy tract before 1927. The activities of the Tata Chemicals Ltd., Mithapur cover a very vast area, but the actual area covered by the salt works is about 1,100 acres. Unlike other maritime salt works, these are not situated on the edge of any creek, and the brine supply is taken by tapping the open sea by making suitable intake sluice gates there connecting it with the marine lake. The brine gets into this marine lake during high tides and flows by gravity flow by a lead of more than a mile to the condensers, whereby it increases in density considerably. This gain in density has actually effected a very appreciable increase in the overall production of salt and the production per acre has gone over even 100 tons. In addition, pumping charges have been reduced considerably since, by the time first pumping is to be done to raise the level of the brine, its density rises up to about 6 to 8° Be. from about 3·5° Be. The works are scientifically laid out and proper arrangements have been made for the collection of bitterns as the same are being used for the recovery of by-products. Electrically driven pumps have been installed at suitable places and the works are laid out with a 2' gauge track for transport of the salt from the works to the washery and storage grounds. The haulage is done in tip wagons pulled up by diesel locos. The works have got a set of crushing mills to crush their salt and these are the only works on this coast which had installed, as early as 1935-36, a washery to wash all the salt before it is put to use either in the chemical works or for export. Salt is mechanically washed with concentrated brine and in addition to the removal of gypsum, clay etc., magnesium salts sticking to the outer surfaces of the crystals are

also washed away appreciably, as a result of which, much better salt is collected. This is the only washery of its kind and has been fabricated locally. This enables the works to obtain salt of above 98% purity and of low sulphate content, as required for manufacture of chemicals. This washery contains a number of parallel troughs which are set at a slight slope and in which the salt is moved up the incline by screw conveyors against a counter current flow of saturated brine. When the salt has reached the end of the trough, it is washed by a spray of sea water to remove the adhering brine and is then allowed to drain over a draining board and conveyed by belt conveyors for storage in heaps in the open storage platforms. The brine leaving the trough flows a gravity flow into large circular cement tank which serves the purpose of a classifier and where the suspended impurities are allowed to settle. The sludge is removed from the conical bottom of the tank by a diaphragm pump whilst the clear brine overflows the top of the classifier and is used over again. Its rated capacity is about 500 tons per day. Mechanical belt conveyors and elevators are installed for stacking of washed salt along the storeyards.

In 1952, the works installed a vacuum multiple effect brine evaporator capable of producing about 6,10,000 maunds (22,500 tons) of vacuum salt per year and about 60,000 gallons of gained distilled water per day. This plant went into commission in November, 1952, and is the first of its kind installed in this country. One more set is to be installed in the near future. The salt produced is, no doubt, of a very high purity (about 98.8% sodium chloride), suitable not only for table use but also for industrial purposes where salt of an exceptional purity is needed. The distilled water is being used in their high pressure boilers to relieve the shortage of good quality water which is being keenly felt at Mithapur at present.

About 3,80,000 maunds of vacuum salt was produced in 1955. This plant is, however, not working at its rated capacity and some difficulties of mechanical nature are being experienced. The works have further development plans in hand and are proposing to develop the two sites at Okhamadhi, where they worked in the beginning and Aramda, a place between Mithapur and Okha, which is also considered fit for locating a salt works. If both these sites are suitably brought under cultivation, they are capable of yielding not less than one lakh tons of salt a year. The works have already requested the Bombay Government for lease of the said lands to them for this purpose. During 1952-53, the works collected about 1,55,000 maunds from the natural formations at Madhi and brought it by rail to Mithapur for use there.

The manufacture operations and the utilisation of brine therefore are regulated in such a way that the production and removal of salt can be continued throughout the span of a year, excepting occasionally for a couple of weeks only in July or August every year, when some sudden and unusually concentrated showers of rainfall may be received. In addition, during the summer months, when the production gets into full swing, the storage is continued day and night and the works are equipped with flood lights to facilitate working at nights.

The recovery of by-products was started from 1931, soon after the inception of the works, and at present Epsom salt, Bromine and Bromides, Potassium Chloride, Magnesium Chloride (and Magnesium Oxide) are being recovered for which up to date plants have been installed. Soda Ash, Caustic

Soda, Liquid Chlorine, Bleaching Powder, Hydrochloric Acid and Zinc Chloride are being manufactured with salt as raw material. The approximate quantities of different by-products recovered during 1955-56 are given below:—

Magnesium chloride	1,144.4 tons.
Potassium chloride	26.2 tons.
Magnesium sulphate	600 tons.
Gypsum	2,628 tons.
Bromides(Sodium,Potassium and Ammonium)	157 tons.
Bromine	3,20,000 lbs.

This is the only salt works in India where by-products are being recovered from the bitterns, and they are maintaining an up to date laboratory to investigate the problems arising in this connection, and a library containing technical books. An observatory is also maintained to record the meteorological data. The works are under the control of highly qualified chemists and engineers.

Tata Chemicals Ltd. have since invested more than Rs. 2 crores in their salt works, chemical works and the modern colony at Mithapur. This colony provides residential accommodation for all the members of the staff and labourers, and the quarters have been built on sanitary and hygienic principles. There are electric installations, a bank, railway station, post and telegraph office, telephone connections and a well-equipped and modern hospital, where medical service is given free to the employees of the works. No drinking water being available at the site itself, the same is being brought after its filtration and purification from a distance of about 10 miles, where a large tank has been harnessed for this purpose and necessary pumps have been installed. In the beginning for about eight years, however, water had to be brought in bullock carts from Aramda, a distance of about 5 miles.

The works have always kept in view the necessity of improving their processes of manufacture of salt and research work has been carried on every now and then. Experiments were done with "Solivop" dye, a product manufactured by the Imperial Chemical Industries with a view to accelerate the evaporation of brine to increase the yield of salt from the same crystallising area in a specified period. It has been found that the production thus increased by about 20%, but the economics of this method are still under consideration. It was reported that the addition of manganese sulphate in certain quantities to the mother liquor in crystallising pans helped produce purer and harder crystals of salt and experiments in this direction were also conducted; but no conclusive results have so far been obtained, and this chemical is not available easily.

The works are also proposing to mechanise the collection and lifting of salt from the crystallisers and qualified technical advice is being sought for this purpose.

Production.—Production since 1947 is given below, and the potential capacity of existing works is about 30,00,000 maunds.

Year	Production (B. mds.)
1947	19,75,000
1948	23,96,000
1949	23,13,000
1950	26,39,000
1951	27,47,000
1952	20,76,000
1953	22,61,000
1954	22,90,000
1955	33,08,000

} Due to unusual
labour strike,
rains and cyclone.

About 20,00,000 B. mds. salt is used every year for the manufacture of heavy chemicals.

(2) *The Maharaja Salt Works, Co., Ltd., Lavanpur*

History.—These salt works, first called “The Morvi Salt Works”, came into being at Lavanpur about seven miles from Navlakhi Port, in Morvi State in about 1929 under an agreement executed by the State with Shri Jumnadas Nathuram, who was the promoter, and his partners. This permission was given for a period of five years in the first instance from 1929, and was subsequently extended by ten years in May, 1932. The works had obtained monopoly for salt manufacture and its export in Morvi State. In about 1942, the works were converted into a private limited company in the name of the Maharaja Salt Works Co. Ltd., Lavanpur. This Agreement expired in 1942, and was further extended by ten years up to May, 1952. Subsequently in October, 1947, it was extended by another fifteen years and the existing tenure of the Agreement will now last till May, 1967. The following are the main terms of this Agreement. The works hold a monopoly to manufacture salt in the Morvi State till May, 1967.

(1) Royalty was to be paid at the following rates:

- (a) At two annas per maund of salt sold to public of Morvi State.
- (b) At nine pies per maund of salt sold in Kathiawar.
- (c) At eight annas per ton on salt sold outside Kathiawar and exported by sea.

(2) The selling rate fixed for local sales for washed salt was four annas per maund.

(3) A special railway freight of $\frac{1}{5}$ pie per maund was fixed for despatch of salt by rail in Kathiawar.

(4) The works were to pay as port charges at the rate of Rs. $\frac{1}{4}$ per ton for export of their salt.

(5) An import duty at 1% on goods imported from British India by sea or rail was to be charged, and tariff rate was to be charged on goods imported from foreign countries.

(6) No rent was to be charged for land given out for salt manufacture.

(7) Rs. 1/4/- per *bigha* was to be charged for lands used for residential buildings.

(8) Export of salt by sea from Navlakhi and by rail to British India was to be made in accordance with the rules and regulations that may be enforced by the Government of India in this behalf.

(9) The question regarding the manufacture of by-products and gypsum etc. was left undecided and was to be considered when necessary.

The monopoly was, however, terminated in 1950 by the Saurashtra Government with their consent.

Situation and layout.—The works were started in 1929 at Lavanpur near Navlakhi Port in about 800 acres. The works have installed automatic sluice gates to take in brine and pumps are used for lifting the same at suitable points. The works are laid with 2' gauge track and salt is hauled up to the stores by diesel locos in tip wagons. They have installed crushing mills to crush their salt and stackers are used for stacking the same. A small generator is also in commission to supply electricity for lighting purposes. The storage yards are opposite Lavanpur station which is linked with Navlakhi Port by a metre gauge track. All the produce is exported to Calcutta, and salt has to be moved from Lavanpur to Navlakhi in ballast trains and is stored there for shipment purposes.

In 1948-49, the works opened another salt works at a distance of about two miles from Lavanpur, near village Versamedi, which are now called "The Versamedi Salt Works", under the ownership of the same proprietors. These works cover a total area of about 1,830 acres and have been since developed. Automatic gates and pumping sets have been installed and the crystallising pans have been laid with a 2' gauge track. Salt is hauled up to stores in tip wagons pulled with locomotives. Crushing mills were installed in 1953 and stackers are being used for storage purposes. For export purpose, they have constructed their own jetty on the edge of the creek, which emanates from Navlakhi Port from a distance of about 3 miles. This jetty works with tides and loading has, therefore, to be restricted to tide times. Endless belt elevators have been installed at the jetty for loading of the barges.

Barges and tugs are hired from Navlakhi Port and the steamer anchorage is at a distance of about five miles from this jetty. Water is supplied to the labourers in motor trucks, and the administration of the two salt works is the same. The works have constructed their colony near the station where quarters for the staff and workers have been constructed.

Production.—The potential capacity of these two units is about 27,00,000 B. mds. All the produce is entirely meant for export by sea, local sales being negligible. Production since 1947 has been as follows:—

Year	Production (B. mds.)
1947	10,46,000
1948	10,90,000
1949	11,13,000
1950	20,14,000
1951	18,17,000
1952	21,12,000
1953	22,53,000
1954	23,71,000
1955	23,68,000

(3) *The Saurashtra Salt Manufacturing Co., Porbandar*

History.—These works started under the name “Nadir Salt Works, Porbandar” in the year 1931 under an Agreement dated 26-10-1931 executed between Mr. Edulji Dinshaw and Porbandar State. The management of the works changed in the year 1948, when the name was changed to “The Saurashtra Salt Manufacturing Co., Porbandar”. Mr. Edulji Dinshaw was the promoter and Mr. G. T. Kamdar was associated with it, and the works were constructed under their supervision. The lease agreement conferred on the works a monopoly to manufacture salt in Porbandar State for a period of 30 years from 1931. The following are the main terms of this agreement:—

(1) The works were granted a monopoly to manufacture salt for 30 years in the State and were made liable to abide by the rules and regulations as affecting the production and distribution of salt as may be framed by the Government of India from time to time.

(2) The public was allowed to use natural salt wherever it could be had in the State, but nobody was permitted to bring such salt in cart loads into Porbandar.

(3) The works were to sell their salt at six annas per B. md. for consumption within the State.

(4) A royalty of Re. 0/0/9 per B. md. was to be levied on salt sold in Kathiawar. The following scale of royalty was fixed for export outside Kathiawar subject to a minimum of Rs.2,500 per annum:—

	Rs.	as.	p.
(a) Up to 25,000 tons	0	8	0 Per ton.
(b) 25,000 to 55,000 tons	0	7	0 „
(c) Above 55,000 tons.	0	6	0 „

(5) The works were to pay annual ground rent at the rate of Rs. 5 per acre for the land on which buildings were to be constructed and eight annas per acre for the land used for manufacture of salt, and the yearly rent was not to be less than Rs. 1,000.

(6) The works were to pay six annas per ton as lighterage charges for conveying barges loaded with salt up to the steamers.

(7) The loading of barges was to be done by the works at their own cost.

(8) If any by-products were to be manufactured and exported outside Porbandar State, the export duty of 1% on the selling price was to be recovered for the first fifteen years and of 2% for the next fifteen years.

(9) The works were to start construction of the salt works within one year of this agreement and they were to start export of salt within two years' time.

(10) No taxation was to be levied on these works except the general taxation in force at that time.

(11) The conditions of this Agreement could be changed by mutual consent during the duration of this monopoly.

The monopoly was, however, terminated in 1950 by the Saurashtra Government with their consent.

Situation and layout.—These salt works are situated near Porbandar Port and on the other side of the creek and occupy an area of about 1,400 acres. They have constructed two sets of automatic gates near the Port and take in sufficient brine for their works during high tides. Bitterns channels have been constructed to discharge the bitterns into the sea. The works have installed necessary pumping stations to pump brine at its different stages, and crushing mills to crush the salt produced. 2' gauge track has been laid in the works to haul up the salt from the works to the crushing mills and the jetty side, and tip wagons and locomotives are used for the purpose. The works are maintaining stackers for stacking salt.

The works are maintaining their own water and electric supply system and a small dispensary. Quarters have been built in the salt works premises to accommodate the staff and the labourers.

Whereas the crushing mills are situated in the premises of the salt works, the main stacking ground for purposes of shipment is near the port at a distance of about one and a half miles from here. Porbandar is a tidal port and, as such, barges can be loaded only during tide time the steamer anchorage being about two miles from the port. The works have not constructed any *pucca* jetty and continue to load their salt by making temporary arrangements for the berthing of barges along their stacking ground with the help of wooden poles etc. This port functions for about eight months in a year from October to May, as during monsoon months the sea gets rough and steamers cannot be handled.

Production.—The potential capacity is about 24,00,000 maunds. Their production is meant entirely for export by sea, and the local issues are insignificant. The production since 1948 has been as follows:—

Year	Production (B. Mds.)
1948	14,32,000
1949	17,95,000
1950	17,58,000
1951	22,32,000
1952	22,56,000
1953	20,13,000
1954	17,83,000
1955	19,34,000

(4) *The United Salt Works and Industries Ltd., Kandla*

The State of Kutch has material advantages for the development of salt industry. By scientific and economic development it is feasible to produce in Kutch a substantial quantity of high grade salt at a reasonable price.

Early History (Period 1934 to 1941).—During the regime of His Highness Maharajadhiraj Mirza Maharao Shri Khengarji Savai Bahadur, G.C.S.I., G.C.I.E., Maharao of Kutch, Sir Geoffrey Archer, K.C.M.G., Ex-Governor of Sudan was granted Monopoly Rights for manufacture of salt at Kandla in the State of Kutch. The works were then known as Kutch Salt Works. The main terms of the monopoly Agreement being:—

(1) The Works were to abide by the Rules and Regulations regarding the production and distribution of salt as may be prescribed by the Government of India from time to time.

(2) The Works were granted irrevocable and sole and exclusive licence and authority to manufacture and refine salt at Kandla for a period of 40 years, and to export the same, crushed or uncrushed, to any country or place outside and in India, according to the existing Rules of the British Government.

(3) The Works were permitted to manufacture and to recover by products from the bitterns and could also manufacture other chemicals from salt.

(4) The Works were to pay Ground Rent at the rate of Rs. 2 per acre of land that might be taken up by them.

(5) The Works were to pay Royalty at the rate of eight annas per ton of salt exported by them from the State up to 60,000 tons and at the rate of ten annas per ton on the quantities in excess of this tonnage.

(6) The Works were to pay Royalty at the rate of 7% on the manufacture cost per ton of all by-products so exported for sale.

(7) These Royalties were to be deemed as including all existing and future rates, taxes, assessments, duties, impositions, outgoings, burdens, etc., etc., and they were exempted from all such payments.

(8) The State was not to charge or levy any duty, impositions, taxes, or burdens on any machinery that the works might import during the first two years of this Agreement.

The construction of Works was started in 1934 and was completed by 1937. The operation results during 1937 to 1941 being:—

Year ^a	Production		Shipments	
	Tons ^b	B. Mds.	Tons	B. Mds.
1934 to 1937	(Development period yielding some Production.)			
1937-38	4,210	1,14,605	6,775	1,84,430
1938-39	14,046	3,82,362	6,775	1,84,430
1939-40	28,431	7,73,953	29,516	*8,03,485
1940-41	29,747	8,09,779	34,699	*9,44,575

*Years of drought.

During 1939 the "Kutch Salt Works" faced financial crisis and had to seek assistance of "Hajeebhoy Aden Salt Works Ltd." for their salt on Agency terms. This arrangement was terminated as the Partnership could make alternate arrangements which, however, did not last long.

In October 1941, after protracted negotiations, it was mutually agreed to float "The United Salt Works and Industries Limited" with a share capital of Rs. 30,00,000 divided into ordinary share capital of Rs. 24,00,000 and preference share capital of Rs. 6,00,000. This new company had acquired the "Hajeebhoy Aden Salt Works Ltd." (since defunct) at par value Rs. 10,30,750 and the "Kutch Salt Works" at Rs. 7,00,000.

The new company named the Works as "Kandla Salt Works" which at the time of taking over occupied 560 acres of land with an average annual yield of 19,000 tons.

Though owing to defective lay-out and other hardships, consequent upon worsening of wai conditions all efforts towards increasing the production proved futile, the Kandla Works could at least succeed in producing "High Class Fine White Salt" which in turn commanded for same a preferential demand in consuming centres.

As regards "Kandla Kurkutch Salt" its crystals are distinguished by the smallness of their grains, colour and chemical composition,. Smaller crystals are formed due to rapidity of crystallisation, assisted by high temperature and prevalence of strong winds.

Purity of salt manufactured at Kandla is largely due to favourable location of the Works and care exercised during process of condensation. The density of brine is rigidly watched and particular care is taken to ensure that condensation beyond 28·5°/29° Be' is not permitted. The beds of the salt pans are maintained properly cleaned, tamped and are always kept covered with a thin layer of salt to obtain clean white salt.

On cessation of the World War II under expert advice, with a view to increase production simultaneously with rectification of defects in layout, the area under development was extended to 1,400 (actual 1374·39) acres. The production during 194-147 was as under:—

Period	Production		Shipment		Variations due to
	Tons	B. Mds.	Tons	B. Mds.	
1941-42	17,493	4,76,191	17,450	4,75,021	
1942-43	32,692	8,89,944	17,990	4,89,720	Drought.
1943-44	22,069	6,00,758	27,083	7,37,259	
1944-45	19,512	5,31,156	35,460	9,65,293	Heavy Rains.
1945-46	27,537	7,49,617	27,583	7,50,869	
1946-47	41,534	11,30,645	42,338	11,52,534	

Position after Merger.—In June 1948 the Central Government took over control of the Administration of the State and following this change the Works were served with a ban order prohibiting expansion as the area occupied by the Works was recommended by the Major Port Enquiry Committee as being suitable for the location of the Major Port at Kandla and this was followed by determination of Monopoly rights conferred upon the Company, under agreement with His Highness' Government.

The Works had in consequence to suspend development programme. However, when the members of the Salt Experts Committee, appointed by the Government of India—paid a visit to the works, commented very

favourably on the layout and produce of these salt works, and on the Government Ban Order they have, in their report stated:—

“That if this excellent Works had to be disbanded, it will give a serious set-back to the Indian Salt Industry. We had recommended in our interim Report that Government should seriously consider ways and means for leaving this Works undisturbed on the present site. Such a decision will enable the Works to carry on their expansion programme of doubling their output and making a substantial contribution to the filling up of the present gap in the country.”

Simultaneously the proprietors of the Works, under arrangement with the Government of India had also, at their own cost, consulted some eminent Engineers in London and backed up with their findings and recommendations that the best site for the development of a major port at Kandla was towards the south of the Works and as such to enable them to pursue their expansion programme they had in 1950 approached the Government of India for their final decision on this issue. In the meanwhile, the Government of India had also, based on their independent enquiries, decided to locate the major port at Kandla to the south of the Works. Thus, the Kandla Works were saved from being scraped and from early 1951 the Works Management again took up seriously their development activities which had faced unavoidable suspensions. Simultaneously, the Works Management applied for and obtained additional 1,374·39 acres of land adjacent to their works.

Situation and Layout.—The Kandla Works are located to the North of the new Kandla port. The whole area is being developed as a single unit, by suitably altering and realigning the old layout to fit in with the new developments.

The levels of the land are such that no fresh sea water can be taken in by gravitational flow during tide periods and necessarily the entire sea brine required for production of salt has to be pumped from an off-shoot of the Kandla Creek to an average height of 25 ft.

A chain of reservoirs covering 880 acres and condensers (grouped in 5 stages) covering 1,200 acres has been laid to give a long circuitous lead to the freshly pumped sea water so that by the time the brine travels through all these stages and reaches the last condenser, its density is raised to 23°-24° Beaume. To arrest salt precipitation *en-route*, adequate provision has also been made to provide diluted brine for salt pans situated far away from the last condenser and crystallising area covers 277 acres.

The works have got a fully equipped workshop to attend to their needs in the works. Separate colonies have been constructed to accommodate the staff and workers and a Medical Officer and a dispensary are provided. Water, electricity and medical aid are supplied free of cost. A small laboratory has recently been added to keep chemical control over the manufacture operations. The management have still further ambitious programmes of developments and it is proposed to mechanise the lifting and transport of salt from the pans by laying mobile belt conveyors. Similarly such conveyors are proposed to be installed for loading of barges direct from the storage grounds. They have already kept in view the requirements of energy for these purposes while designing their new power house.

Production.—At present, the Kandla works are the biggest single unit in the private sector and their annual production is now also the highest on the West Coast of India, the progressive increase wherein can be judged from the following statistics:—

Year	Production	
	Tons.	B. Mds.
1947-48	59,663	16,24,155
1948-49	71,806	19,54,713
1949-50	58,054	15,80,350
1950-51	55,067	14,99,043
1951-52	99,644	27,12,527
1952-53	1,13,698	30,95,101
1953-54	1,31,628	35,83,195
1954-55	1,69,025	46,20,000

The Works' ultimate production target is estimated at 1,70,000 tons (46,27,700 maunds) and this is expected to be reached within next two years.

The Kandla Works also recover every third year gypsum from their condensers, which is partially sold to the neighbouring cement factory at Dwarka and partially utilised by themselves for hardening Bunds and Platforms and for making roads.

Until 1952 the entire produce of the Kandla Works used to be exported to Calcutta but from 1953 it is being substantially exported to Japan and with the establishment of Kandla-Deesa Railway Link the Works have been allowed from 1st January 1953, a Zone for despatch of the Works' produce under "Preferential Traffic". During Calendar year 1953 the Zonal quota of 14,40,000 maunds was allotted to the Kandla Works for supply by rail to the six districts of U. P., viz. Mirzapur, Benares, Jaunpur, Faizabad, Barabanki and Azamgarh. The works despatched 3,080 M.G. wagons (13,58,600 maunds) to these districts during 1953.

During 1954 the Zonal districts were changed and 6 new districts namely, Agra, Mathura, Aligarh, Bulandshahr, Meerut and Muzaffarnagar were substituted for the same supply quota as during 1953. Supply to these districts during 1954 was 1,559 M.G. wagons. Besides 674 M.G. wagons were supplied to 6 old districts and an *ad hoc* quota of 946 wagons to some other districts of U. P. Some supplies were also made to North Bihar and Delhi.

For U. P. districts the current supply rate for kurkutch salt f. o. r. Kandla delivery—exclusive of cost of gunny bags—is Re. -/12/- per B. md. However, as the districts have so far avoided to acquire their total salt requirements from Kandla Works, utilisation of same for despatches to Bihar has been permitted since early 1955. At present salt is going to U.P. districts and North Bihar.

The wagon supply position, though not up to the mark, is fairly satisfactory. To facilitate movement of salt by rail, Kandla Works have been provided siding facility as a part of Kandla station yard. This siding can accommodate about 30 wagons at a time and the works have constructed a big transit shed for stacking bags filled with salt and awaiting despatch. The average railway freight per maund from Kandla to Zonal districts in U. P. is for wagon loads Rs. 1/4/- per maund.

(5) *The Digvijaysinhji Salt Works, Ltd., Jamnagar*

Historical.—Under an Agreement dated the 22nd June, 1936, the Digvijaysinhji Salt Works, Ltd. Bedi Port, Jamnagar were permitted to construct salt works in Nawanagar State by the Jam Saheb of Nawanagar, after whose name these works are named. The works were completed in December 1936. Mr. N. T. Kamdar and his brother Mr. R. T. Kamdar were the promoters of this concern, and the works were constructed under their personal supervision.

Under the terms of the Agreement, the works were granted a monopoly to produce salt in Nawanagar State for a period of 20 years and were given many other facilities. The monopoly was, however, rescinded in 1947 with the consent of the works and three more salt works were permitted to be started in Nawanagar State by the Jam Saheb. The following are some of the important provisions of this Agreement:—

(1) A monopoly to produce salt in Nawanagar State for 20 years from 1936, and the works were to pay a royalty of eight annas per ton on all salt despatched outside the State to places approved by the British Government.

(2) A fixed ground rent of Rs. 500 per year was fixed for the area to be occupied.

(3) The works were to sell uncrushed salt ex-factory at two annas per B. maund for consumption within the Nawanagar State and a special rate of 1/5 pie per mile per B. md. was to be charged on the salt booked by rail within Kathiawar.

(4) The State was to tug the salt cargo with its own implements to the steamers, but the charges for loading of salt in barges were to be paid by the works, and they were to pay $5\frac{1}{2}$ annas per ton to the State as shipping charges and a custom duty at tariff rate on the machinery imported from British India by rail was to be charged at Rs. 1/9/-%.

(5) The works were given the right to extract by-products from the bitterns and a royalty of Rs. 1/9/-% was to be charged on these products by the State, and the railway was to give facilities for the movement of these chemicals.

(6) The works were required to manufacture 20,000 tons of salt within the first five years of their construction and were to engage old agarias and labourers belonging to Nawanagar State, as far as possible. They agreed that the construction of the works and the disposal of salt were subject to the rules and regulations laid down by the Government of India from time to time.

Situation and layout.—The works are situated to the west of Bedi Port at a distance of about seven miles from Jamnagar City and cover an area of about 986 acres. There is another area of about 270 acres close to the

works which, under the original Agreement, was to be used by them, but later on this seems to have been denied to them because of the objections raised by the local residents. The works have constructed two sets of automatic sluice gates at suitable points to take in sea water at high tides, and full use is made of the contour of this piece of land, and the brine is allowed to flow by gravity as far as possible. Adequate lead is given to the flow of the sea brine through a series of condensers, whereby the brine attains density of about 23 to 24° Be. by the time it reaches the crystalliser. The works have installed pumping stations, crushing mills, a generator, stacking machine and belt conveyors, etc. and the capacity of the crushing mills is sufficient to handle all their annual produce. The works are laid out with 2·5' gauge track and salt is hauled from the crystallising pans in tip wagons and locomotives are used for their traction to the storage grounds and crushing mills.

The works are maintaining their own water and electric supply system, a dispensary, an observatory and a primary standard school. They have constructed quarters in the factory premises for their staff and labourers. Regular records are being maintained of the meteorological data and the depths and densities of the various condensers and pans are taken daily and recorded. Medical service is given free to the staff and local workers.

These were the first salt works in Kathiawar and Kutch who started the recovery of gypsum, and the annual production of this chemical is about 1,500 tons. Their crushing mills and storage grounds are located just near the wharf on the Bedi creek and the barges are loaded by manual labourers from their stacking grounds. Bedi Port being a tidal port, they can load barges only twice a day during tide times and the steamer anchorage is at a distance of about seven miles in the Gulf of Kutch from their own jetty which has recently been purchased by them from the Port Department of the Saurashtra Government. The Bedi Port railway siding is quite adjacent to the works and they can easily despatch salt by rail.

Production.—The potential capacity of these works is about 16,00,000 maunds a year. This figure has already been attained. Their production is meant entirely for export by sea, local sales being negligible. The production since 1947 has been as follows:—

Year	Production (B. Mds.)
1947	11,50,000
1948	11,18,000
1949	12,05,000
1950	14,00,000
1951	15,35,000
1952	15,50,000
1953	14,63,000
1954	11,83,000
1955	16,14,000

(6) *The Bhavnagar Salt and Industrial Works, Ltd., Bhavnagar*

History.—These salt works came into being in 1943, when the following persons entered into an agreement with the State of Bhavnagar for the production of salt in the State:—

(1) Seth Nanji Kalidas, (2) Mr. Edulji Dinshaw, (3) Mr. G. T. Kamdar, and (4) Mr. Bhogilal Maganlal.

The works started as a private limited concern, and were granted a monopoly to manufacture salt in the State for a period of 51 years. The following are the main terms of this Agreement, and the works agreed to abide by the rules and regulations as might be made from time to time by the Government of India affecting the production and distribution of salt. The construction was completed in 1946:—

(1) The works were given a monopoly for 51 years to manufacture salt in the State, but this did not imply the monopoly to manufacture chemicals from salt in the State.

(2) The following scales of royalty were fixed:—

(a) Rs. 4/8/- per ton on sale of salt in Bhavnagar and Kathiawar.

(b) Re. -/6/- per ton on sale outside Kathiawar by rail and by sea.

(3) The works agreed to pay an annual ground rent of Rs. 100 only for the land required by them for buildings etc.

(4) The works agreed to sell salt for local consumption in Bhavnagar State at ten annas per B. md.

(5) The works were to pay one anna per ton as wharfage charges at the port and were to load their produce on the steamer at their own cost, with the facilities obtained from the Bhavnagar Port Department at the usual rates.

(6) For the transport of salt from the salt works to the jetty side for purposes of shipment, the railway were to charge a freight of 0.75 pie per B. md. This rate was, however, subject to revision.

These conditions were liable to revision by mutual consent. The monopoly was, however, terminated by the Saurashtra Government with the consent of the works in 1952.

Situation and layout.—The works are situated in close proximity on the west of new Bhavnagar port at a distance of about seven miles from Bhavnagar City. The total area covered by the works till 1952 was 2,220 acres, and they have obtained 3,406 acres more between their existing site and the old Port. Their existing works are now under development to cover a part of this new acquisition. This old area lies on both sides of the railway track running from station to the port, and the area towards its south is used entirely as catchment area, where a set of sluice gates has been constructed to obtain sea water during tidal actions. The works have installed necessary pumps to handle the brine at different stages, and have got a set of crushing mills to crush all the salt produced in their salt works and stackers have been installed to stack it. The works are laid with a metre gauge track leading from the works to the crushing mills and to the jetty side and bullocks are used for haulage of metre gauge trucks loaded with salt from the works to the jetty. The works have recently been electrified with a view to facilitate working during nights, if necessary.

The works are maintaining their own water and electric supply systems and a dispensary. Quarters have been constructed in the vicinity of the works for accommodating their staff and labourers. The works have prepared artificial beds in the crystallisers by laying kiln burnt bricks with a view to produce absolutely clean salt.

The works ship their salt from new Port of Bhavnagar, the wharf being very close to the crushing mills and stores. Salt is brought in M. G. trucks hauled by a loco at the time of shipments and the steamers can anchor

alongside the wharf for loading about 7,000 tons. For more loading, the steamers have to anchor in the Gulf about 2 miles away. The railway siding is close by and salt can be despatched by rail conveniently.

Production.—The potential capacity of these works is about 40,00,000 maunds. This capacity can be further increased by expanding the works as land is available. Their production is meant entirely for export by sea and local issues are negligible. The production since 1948 has been as follows:—

Year	Production (B. mds.)
1948	9,66,000
1949	14,25,000
1950	19,78,000
1951	22,87,000
1952	27,53,000
1953	21,26,000
1954	20,39,000
1955	30,21,000

(7) *The Junagadh Salt and Allied Chemicals Works, Bherai*

History.—These salt works came into being in 1944 under an Agreement executed between Seth Abdul Hussein Mulla Jivaji of Junagadh with other partners and the Junagadh State in December, 1943. The salt works with their assets and liabilities were, however, purchased by Seth Jivaji in 1950. The lease agreement conferred on them a monopoly to manufacture and sell salt in Junagadh and Mangrol States for a period of 30 years from December, 1943. The following are the main terms of this Agreement:—

(1) The works were given the right to extend the existing salt *agars* or start new salt works anywhere in the State and to export salt outside the State, i.e. within Kathiawar, or to British India subject to the rules and regulations that might be framed by the Government of India in this behalf.

(2) No other person or company was to be permitted to manufacture salt or its by-products at any place within the State for a period of 30 years.

(3) The works were to pay to the State a fixed sum of Rs. 10,000 per annum only as royalty for the export of salt outside Junagadh State, and rent in lieu of the lands and buildings occupied by the salt works.

(4) They were not to pay any additional royalty on export of salt up to the first 3,000 tons in a year, but exports exceeding 3,000 tons of salt in a year were liable to royalty at the rate of six annas per ton in addition to the fixed royalty of Rs. 10,000 a year.

(5) All machinery imported for the use of the salt works from foreign countries was to be charged with import duty according to the Imperial Tariff Schedule, but any machinery imported from British India was to be imported free of any import duty.

(6) The works were bound to supply salt to the whole of Junagadh and Mangrol States at the rates at which they had been purchasing salt

from agarias in 1943. If, however, their purchase price of salt increased, the State was to pay the same price to the works, and they were not to make any profit in this transaction.

(7) The works were given the right to close down all the existing *agars*, if necessary, and they were to take the surplus stock of salt lying at the *agars* at a fixed rate of Rs. 10/4/- per ton, over and above the lease money of Rs.10,000 a year.

(8) The works were granted the sole right to manufacture any by-products or chemicals for which they were to pay a royalty of 1½% on the naked selling price at the salt works.

The monopoly was, however, terminated by the Saurashtra Government with the consent of the works in 1951.

Situation and layout.—These salt works are situated near a small town called Bherai on the southern coast of Saurashtra, which is now included in the Gohilwad district of Saurashtra State, and are on the edge of a creek opposite Port Albert Victor, and cover an area of about 525 acres. These works were constructed without sufficient experience or technical knowledge of this industry and were ill-designed to produce fine grain salt. This resulted in an uneconomic production of an average quality of salt. The works have recently obtained about 840 acres more land for increasing their activities, and are now under development on proper lines. The works have so far installed one pumping set to pump brine from the creek to the reservoirs and condensers and arrangements are being made for the proper discharge of bitterns and another pump is also proposed to be installed soon. Some of the pans are laid with 2' gauge track, and tubs have also been purchased for hauling salt from the pans to the jetty side. Locos are also being purchased. The works have constructed their own wooden jetty at the creek, which is quite close to the salt works. They do not possess any shipping facilities and barges and tugs have to be obtained from Bhavnagar port, more than 100 miles away by sea, and the steamers anchorage is at a distance of about 2 miles from the jetty. The jetty is constructed at such a point from where barges can be loaded all the twenty-four hours irrespective of tides. Obtaining of tugs and barges from Bhavnagar necessarily adds to their shipping charges.

Production.—The potential capacity of these works is now about 16,00,000 maunds a year, which can be achieved only after all the area is fully developed scientifically. This salt is meant for export by sea, there being no local sales. The nearest railway station is at a distance of about 7 miles and is connected with a *kutch*a road. Production since 1949 is given below:—

Year	Production (B.mds.)
1949	59,000
1950	1,08,000
1951	2,53,000
1952	2,29,000
1953	2,58,000
1954	1,84,000
1955	4,77,000

(8) *The Nawab Sidi Mohamed Khan Salt Works, Jafarabad*

History.—These salt works came into being in 1944 under an Agreement executed in 1943 between Janjira State (Jafarabad being a Dependency of Janjira State, and Khan Bahadur Faiz Mohamed Khan of the Dilwar Syndicate, Ltd., Junagadh was the promoter. The works were granted a monopoly for a period of 30 years to manufacture salt in the Dependency of Jafarabad, and they agreed to abide by the rules and regulations as might be framed by the Government of India from time to time regulating the production and distribution of salt.

These salt works are owned by the Kathiawar Industries Ltd., Chorvad Road, which is a private limited concern, the Managing Agents being the Dilwar Syndicate Ltd., Junagadh, which is also a private limited concern. They have recently submitted to the Saurashtra and Central Governments proposals to start a Soda Ash factory at Jafarabad, where, as reported by them, industrial lime stone is easily available. The following are the main terms of this Agreement:—

(1) The works were granted a monopoly for 30 years from 1944, and they had to supply uncrushed salt to the Dependency of Jafarabad at a fixed price of two annas per B. md. ex-works.

(2) The works had to pay royalty on salt exported to any other port of India or to foreign countries at the rate of six annas per ton. No other taxations were to be levied on salt thus exported.

(3) As an immediate guarantee, the works were to pay to the State Rs. 3,000 per year towards royalty, *lagga*, *latri* etc., if they failed to export salt or if the salt exported would bring in an amount less than Rs. 3,000 in any year.

(4) The works were to pay duty at the tariff rates on machinery imported direct from the foreign countries and no further local duties were to be charged.

(5) If the works manufactured any by-products, they were to pay royalty at the rate of Rs. 1/9/-% on all such exports.

The monopoly has, however, been terminated by the Saurashtra Government with their consent in 1951.

Situation and layout.—The works are situated on the edges of Mitiala creek in the close proximity of Jafarabad town on the southern coast of Saurashtra State. The nearest railway station is Rajula at a distance of about 20 miles, and is connected with it by a *Kutch* road. The total area under lease to the works is about 3,486 acres. The works have constructed sets of automatic sluice gates for taking in brine during tidal actions and have installed necessary pumping stations to pump the same as per requirements. The works are laid with 2' gauge track and salt is transported from the crystallisers in tip wagons hauled by diesel locos. They have also installed crushing mills to crush their salt and stackers are being used for stacking purposes. They have constructed their own wooden jetty, where two mobile belt conveyors have been installed for automatic loading of the barges. The works possess their own fleet of barges and tugs for shipment of salt and are thus independent in this respect. Jafarabad port functions only for about eight months in a year, since the steamers cannot be conveniently berthed during the four months

of the monsoon season, when the sea gets very rough. The works have also their own power house and a workshop with casting facilities. They have recently constructed their water works to supply water to their works and labourers. Quarters have been constructed for their labourers.

Production.—The potential capacity of the existing salt works is about 25,00,000 maunds. Their production is meant entirely for export by sea, there being no local sales. They have started the recovery of gypsum also and are recovering about 1,000 tons a year. The production since 1947 is given below:—

Year	Production (B. mds.)
1947	2,18,000
1948	8,34,000
1949	8.63,000
1950	9,42,000
1951	13,34,000
1952	17,96,000
1953	13,62,000
1954	11,44,000
1955	13,48,000

(9) *The Halar Salt and Chemical Works, Jamnagar.*

History.—The monopoly Agreement with the Digvijaysinhji Salt Works Ltd., Jamnagar having been rescinded by the Jam Saheb of Nawagar in the year 1947, M/s. Halar Salt and Chemical Works, Jamnagar were permitted to start salt works at Rozi Port near Jamnagar in the year 1947, *vide* Agreement entered into with the Jam Saheb of Nawagar in September, 1947. The construction work was started soon after in 1948. The terms of the Agreement are the same as for the Digvijaysinhji Salt Works Ltd., Jamnagar, the rates of royalty and ground rent also being the same.

Situation and layout.—The works are situated on the South of Rozi Port at a distance of about six miles from Jamnagar city, and are bifurcated by the road leading from the city to the Rozi Port, and cover a total area of about 1,800 acres, out of which 800 acres have already been developed on the east of the road, and the remaining 1,000 acres on the west of the road are under development. The works have constructed sluice gates to take brine during tidal actions from the creek emanating from the Gulf of Kutch near Rozi Port, but since adequate supplies of brine were not being received from these gates, a pump has been installed on the edges of this creek to feed their works with sufficient brine to make up this deficiency. In the developed area, the works have installed two pumping sets and have laid out 2' gauge track for the haulage of salt to the storage ground and crushing mills. Diesel locomotives are used for this purpose and stackers have been installed for stacking purposes. A crushing mill has recently been installed near their jetty side at Bedi Port at a distance of about one mile from this portion of the works. More crushing mills are proposed to be installed here, when the area under development goes

into production. The works have constructed their own jetty opposite the Bedi Port in the Bedi creek, as no facilities for loading barges existed on this side. This port being a tidal port, barges can be loaded only during the tides twice a day and the steamer anchorage is at a distance of about seven miles in the Gulf of Kutch.

No regular arrangements have so far been made for water and electric supply. Some quarters have recently been constructed for their labourers.

Production.—The potential capacity of these works when completely developed, is about 27,00,000 maunds. All the salt is meant for export by sea, local issues being insignificant. The production since 1948 has been as follows:—

Year	Production (B. mds.)
1948	26,000
1949	6,14,000
1950	11,93,000
1951	13,89,000
1952	19,02,000
1953	20,47,000
1954	17,05,000
1955	29,56,000

(10) *The Maliya Salt Works, Maliya*

History.—The Maliya Salt Works, Maliya, came into being in 1943 in pursuance of an Agreement executed in that year between the Maliya State and Shri Brijkishore Totla of Sambhar Lake and his partners. At that time, the State was being managed under minority administration by the Resident, Western Agencies, Rajkot. The following were the main terms of this Agreement, which granted a monopoly to the works for a period of five years from November, 1943 to manufacture, collect and sell salt in Maliya State and outside Maliya on the following conditions. This Agreement was subsequently extended by seven years up to the end of 1955 during the regime of the Maliya State:—

- (1) The stock to be auctioned by the Political Agent, Rajkot.
- (2) Godowns to be maintained at Maliya and Khakhrechi.
- (3) The selling price was to be five annas per maund in Maliya State and the works had to send salt once every month to every village of the State and sell it at that price.
- (4) The State was to be supplied with free salt for the use of the Royal Family.
- (5) The works could send salt to Kathiawar territories up to 50,000 maunds a year and no salt was to be allowed to be booked outside Kathiawar beyond Viramgam unless specially permitted by the Government of India.
- (6) The royalty on salt sent outside Maliya State was to be charged at the rate of 3 pies per maund.

This Agreement was essentially for the collection and manufacture of salt on a very limited scale, since its transport to British India was not allowed till about 1947, when its booking was allowed to Bengal and Bihar.

Soon after Maliya State was integrated in the United States of Saurashtra in the beginning of 1948 and the administration of salt came under their control. The works have since entered into a fresh lease agreement with that Government. From 1949 they have been included in the Dhrangadhra zone of supply in the Zonal Scheme for distribution of salt, as they do not possess any port and shipping facilities. Their rate of royalty and ground rent is the same as for the inland salt works in Saurashtra.

Situation and layout.—The Maliya Salt Works started their first salt works at a place called “Haripura” (Akodia Mora) in Maliya State on the north coast in 1948, and sea brine is used for purposes of manufacture of salt. The area of these works is about 120 acres only. The nearest rail head then being at Khakhrechi on the Narrow Gauge, emanating from Morvi station, which is on the Metre Gauge, the salt produced there had to be transported by road to the station for onward despatch. In 1950, Maliya station which is at a distance of about five miles was opened for goods traffic and subsequently the works started despatch of their salt from Maliya station instead of Khakhrechi station. Maliya station is on the Metre Gauge and is linked with Morvi. In the meanwhile in 1949, they constructed another small salt works near village Gulaba Dhora at a distance of about three miles from Maliya, but the same were washed away during the floods of 1950 and about 80,000 maunds of salt which was lying on the platforms there was thus washed away. This was an unhappy selection of site and has been abandoned since then. The works are not laid out on scientific lines and are the smallest unit amongst all the maritime salt works on this coast. A long channel connects the creek with the works and the brine at about 10 to 12° Be. is pumped up for use in the works.

2' track line has been laid in the works and a loco is used for haulage purposes. A stacker has been installed for storing salt. A small crushing mill has been installed to crush the salt. The works are situated at an out-of-the way place and water has to be transported from a distance of about three miles in motor trucks.

The potential capacity of these works is about 6,00,000 maunds and though, by commissioning more area this production can be increased, the situation of the works and their distance from the nearest rail head do not encourage them to develop further.

The production since 1949 has been as follows:—

Year	Production (B. mds.)
1949	1,42,000
1950	3,03,000
1951	4,87,000
1952	5,40,000
1953	1,00,000
1954	1,09,000

As some dispute arose between the partners of this works, there has been no production after 1954.

(11) *The Nawanagar Salt & Chemical Industries, Salaya*

History.—These salt works were permitted to be constructed at Salaya in Nawanagar State by an Agreement executed in the year 1948 between the Jam Sahab of Nawanagar and Shri Duttal Mahansariya of Calcutta.

The terms of this Agreement are the same as for the Digvijaysinhji Salt Works Ltd., Jamnagar and the Halar Salt and Chemical Works, Jamnagar.

Situation and layout.—The works are situated on the north coast near village Salaya in Halar District at a distance of about 32 miles by sea from Bedi Port, and cover a total area of about 865 acres. The concrete jetty constructed by the Defence Department during the war was made available to the works by the Jam Saheb, and the same is being used by them for export of their salt.

The anchorage of steamer from this jetty is about two miles away and barges and lighters are obtained from Bedi Port which is at a distance of about 32 miles by sea from this port.

There is yet another area of about 300 acres under the occupation of the salt works which they propose to develop in due course after the existing area is properly developed. The works have constructed sluice gates to get the brine during tidal action, but adequate supplies having not been received through this source, a supplementary pumping plant has been installed on the creek to augment the supply of brine. The works have been laid out with a 2' gauge track for the transport of salt from the pans to the storage ground and jetty and the haulage of salt is done with locomotives. No crushing mill or stackers etc, have so far been installed. No regular arrangements for water or electric supply have so far been made in the works. No staff or labour quarters have so far been constructed.

Production.—The potential capacity of the works is about 12,00,000 maunds with the present area under commission, and the same is likely to increase to about 16,00,000 maunds when the remaining 300 acres of land are also brought under cultivation. The progress of the works so far has been rather slow. The production since 1950 has been as follows:—

Year	Production (B. mds.)
1950	1,16,000
1951	2,97,000
1952	5,02,000
1953	4,64,000
1954	3,32,000
1955	5,02,000

(12) The Jaylaxmi Salt Works, Ltd., Jamnagar

History.—These salt works obtained in 1951 about 1,400 acres of land on lease for purposes of salt manufacture from the Saurashtra Government and were licensed by the Government of India soon after. Soon the construction started near village Nagna at a distance of about 8 miles from Jamnagar City on the coast of Gulf of Kutch, about 6 miles towards the east of Rozi port. Shri Ladhabbhai Odhavji of Jamnagar was the promoter and these works have been started as a private limited concern. This land has been leased on the standard terms of royalty and ground rent as fixed by the Saurashtra Government for the purpose.

Situation and layout.—The works have obtained about 1,400 acres of land on the southern coast of Gulf of Kutch and have already developed about 1,200 acres—the remaining area is under development at present. Two sets of automatic sluice gates have been constructed to take in brine during high tides and two pumping sets have been installed for controlling its movement in the works. A series of condensers have been laid to help condensation of brine and the crystallisers have been laid with 2' gauge track. Salt produced is transported in tip wagons hauled by locomotives to the jetty sidings. Stackers have been installed for storage purposes and the works have recently constructed their own jetty for shipping purposes. Barges and tugs are obtained from Bedi Port, and the steamer anchorage is at a distance of about 6 miles from the jetty. The works have constructed separate quarters for the staff and labourers in the vicinity of their works and necessary arrangements have been made for the supply of water and electricity.

Production.—The potential capacity of the works is about 22,00,000 maunds with the existing area and their production is meant for export by sea, local sales being negligible. Their production since 1952 has been as follows:—

Year	Production (B. mds.)
1952	12,72,000
1953	14,10,000
1954	14,12,000
1955	23,00,000

(13) *The Kutch Vijay Minerals Company, Narayansarovar (Kutch)*

History.—In certain depressions near village Narayansarovar (near Koteswar Port) on the northern coast of Kutch State and on the edges of Kori creek natural salt forms due to the accumulation of sea brine which cannot get back at the time of recession of tides. Shri Hargovind A. Jani of the Kutch Vijay Minerals Co., Bhuj, surveyed all this area and applied for lease and licence to manufacture salt at this site.

Situation, layout and production.—An area of about 1,200 acres near Narayansarovar was leased by the Kutch State and licensed by the Government of India. A couple of embankments to retain more brine were built in 1951 and no regular salt works with a view to control and regulate the movement and evaporation of brine have so far been constructed. The development of this area is very uneconomical because of the absence of any shipping facilities available at Koteswar port which happens to be a minor one. The steamer anchorage can be at a distance of about 25 miles in the open sea and the connecting Kori creek has never been surveyed for navigational purposes. The works actually collected about 67 thousand maunds of salt in 1951 and were not able to dispose of it. The works had originally intended to export their salt by sea from this port, the nearest station being at Bhuj at a distance of about 120 miles. Only small country crafts can possibly ply and with the general reduction in prices of salt; the works did not find it economical any more to export

their salt by sea to the neighbouring consuming areas on the western coast. Shipping in steamer loads remains to be a very remote possibility. The production since 1951 is given below:—

Year	Production (B. mds.)
1951	67,000
1952	61,000
1953	26,000

After 1953 there has been no production.

(14) *The Saurashtra Chemical Co., Mangrol*

History.—The Saurashtra Chemical Co., Mangrol, obtained in 1951 lease of 50 acres of land lying on the sea coast at Mangrol and were given a licence by the Government of India for salt manufacture. The intention of the works is to manufacture small quantity of salt only for local consumption. They had hardly developed the area when the Irrigation Department of the Saurashtra Government constructed a masonry embankment right across their works for reclaiming certain saline tracts. On the protest of the works, the Saurashtra Government have since given them in 1953 an alternate site measuring about 50 acres in the same locality. The usual terms of lease of the Saurashtra Government apply.

Situation, layout and production.—The works have not yet gone into production and they have recently constructed reservoirs, condensers and crystallising pans and they have also installed two pumps to control and regulate the supply of brine. These works when fully developed are likely to produce about 30,000 maunds of salt in a year, which is proposed to be consumed locally at Mangrol and in the neighbouring villages.

(15) *The Kutch Salt and Allied Industries, Ltd., Jakhau (Kutch)*

History.—Soon after the termination of the monopoly of M/s. United Salt Works and Industries, Ltd., Kandla, applications were received by the Chief Commissioner, Kutch, and the Salt Commissioner, New Delhi for leasing and licensing of lands for salt manufacture on the Kutch coast. M/s. Bhawanji A. Khemji, M.P., and Nayak Jethabhai Narsi of Kutch State applied for the lease of a vast piece of land lying near village Sindhori on the north-west coast. After the Government of India had promised to license this site they requested for permission to have another site near Jakhau port in lieu of this one, at a distance of about 15 miles from Sindhori, as the original site did not offer any shipping and port facilities. This was agreed to. They subsequently formed the Kutch Salt and Allied Industries, Ltd., Jakhau as a private limited concern to run these salt works. The terms of the lease are the same as prescribed by the Kutch State for the purpose.

Situation and layout.—These salt works cover an area of about 2,625 acres and about half of it is under development at present. This area lies near Jakhau new port at a distance of about 6 miles from Jakhau town on the north-west coast of Kutch. The works have constructed automatic sluice gates to take in brine during high tides and a series of condensers are fed with pumps which control the movement of brine in the works. The crystallising pans have been laid with 2' gauge track and salt is transported to the crushing mills and jetty sidings in tip wagons hauled with locos. The works have also installed a set of crushing mills near the stores and stackers are being used for stacking purposes. They have constructed their own wooden jetty to load salt into barges, etc. Jakhau port is a minor one without any shipping facilities and barges and tugs have to be arranged by the works all the way from Kandla/Navlakhi incurring heavy expenditure for the same. The Minor Ports Organisation of the Kutch State is arranging to purchase a fleet of barges and tugs for the use of the minor ports and these will be supplied to the salt works when available. Jakhau is not a protected port during monsoons as a result of which shipping can be done only during about 7 months in a year, from October to April, as, otherwise, the sea gets very rough and anchorage of a steamer and loading of barges are very unsafe, the anchorage being at a distance of about 4 miles from the jetty. Jakhau port has since been declared as open for foreign traffic under the Indian Sea Customs Act.

The works have since constructed quarters for their staff and arrangements for the supply of water are being made. They have also constructed a small workshop to attend to the daily needs of the works.

Production.—The potential capacity of these works when fully developed is about 35,00,000 maunds. All this produce is meant for export by sea. There are no local sales. The nearest railway station is at Bhuj at a distance of about 85 miles. Their production since 1952 is as follows:—

Year	Production (B. mds.)
1952	2,72,000
1953	4,35,000
1954	3,19,000
1955	11,97,000

(16) *The Bharat Salt and Chemical Industries, Ltd., Mundra (Kutch)*

History.—Soon after the termination of the monopoly of M/s. United Salt Works and Industries, Ltd., Kandla, about half a dozen parties applied for the leasing and licensing of the site lying near new Mundra port, and it was decided in 1951 to lease and license the same to M/s. S. D. Shethia and Co., Ltd. of Bombay who were one of the applicants. This party has since started the Bharat Salt and Chemical Industries, Ltd., Mundra as a private limited concern to run these salt works. M/s. Madhusudan Bros. Ltd. are the Managing Agents. The terms of the lease are the same as prescribed by the Kutch State for the purpose.

Situation and layout.—The works cover an area of about 2,500 acres lying adjacent to new port Mundra at a distance of about 5 miles from Mundra town on the southern coast of Kutch. It lies on both sides of the main road connecting Mundra town with the new port, and both these sides are under development simultaneously. The works have since constructed automatic sluice gates to take in brine during high tides and a series of condensers have been laid to handle this brine for which purpose pumps have already been installed. The crystallising pans have been laid with 2' gauge track and salt is transported to the jetty sidings in tip wagons hauled by diesel locomotives. The works have constructed their own wooden jetty near the new port to ship their produce by sea. No stackers or crushing mills have been installed so far, as the works are still in their infancy. Mundra port being a minor one, does not offer any shipping facilities and barges and tugs for this purpose have to be obtained by the works from Kandla/Navlakhi, as is the case with the Kutch Salt and Allied Industries, Ltd., Jakhau. The Minor Ports Organisation of the Kutch State is arranging to purchase a fleet of barges and tugs for the use of the minor ports and these will be supplied to the salt works when available. During 1953 they despatched about 85 thousand maunds to U. P. by transporting the same by sea in country crafts from Mundra to Kandla.

Production.—The potential capacity of the works when fully developed is about 35,00,000 maunds. All this produce is meant for export by sea, there being no local sales. The nearest railway station is at Bhuj/Anjar about 40 miles away by road. They went in production in 1953 when they produced 1,12,000 maunds of salt and the production during 1954 and 1955 has been 4,77,000 and 9,11,000 maunds respectively.

(17) *The Salt and Allied Industries, Ltd., Jamnagar*

History.—These salt works obtained a lease of about 1,800 acres of land on the southern coast of Gulf of Kutch at a distance of about 8 miles from Rozi port, in 1951 and were licensed by the Government of India for salt manufacture. M/s. Bahubhai Shah and Ghanshyamdas of Ahmedabad were the promoters who formed the Salt and Allied Industries, Ltd. as a private limited concern to run these salt works. The terms of lease agreement are the same as prescribed by the Saurashtra Government.

Situation and layout.—The area leased is about 1,800 acres about 8 miles towards the east of Rozi port on the southern coast of Gulf of Kutch near a village called Khijadia at a distance of about 10 miles from Jamnagar city. They have already developed about 1,000 acres of this area and a set of sluice gates has been installed to take in brine during high tides. Two pumping sets have already been installed to control the movement of brine. A series of condensers have been constructed. The crystallising pans have been laid with 2' gauge track and salt is transported to the jetty sidings in tip wagons hauled by diesel locomotives. The works have constructed their own jetty for shipping purposes, and they have to obtain barges and tugs from Bedi Port. The steamer anchorage is at a distance of about 6 miles in the Gulf of Kutch. The works have installed one stacker and no crushing mills have been commissioned so far. Quarters for accommodating the labourers have been constructed near the works, and arrangements for the supply of water have been made.

Production.—The potential capacity of the works is about 25,00,000 maunds when all the area is fully developed. All this production is meant for export by sea, local sales being negligible. Jamnagar station is at a distance of about 10 miles from the works. Their production since 1952 has been as follows:—

Year	Production (B. mds.)
1952	4,35,000
1953	10,65,000
1954	12,97,000
1955	17,54,000

(18) *The Nawanagar Salt and Chemical, Industries Jodiya*

History and Situation.—The Nawanagar Salt and Chemical Industries, Salaya obtained lease of a site near port Jodiya in Nawanagar State from the Jam Saheb of Nawanagar in the year 1948. They have since developed their salt works at Salaya only, but they have not yet developed their site at Jodiya so far. However, they did some construction work in 1951; but the same was suspended soon after. If they function, they will be governed by their own terms of lease agreement. The area of the site is about 1,000 acres at a distance of about 25 miles from Jamnagar. If and when the whole area is developed, it is capable of producing about 14,00,000 maunds of salt in a year.

(19) *The Prabhat Salt Works, (Jhinjhuda)*

History.—The land for these salt works was leased by the Saurashtra Government in 1951 and covers an area of about 364 acres. Soon after the Government of India licensed it. Shri Lachhiram Chudiwala of Bombay is the promoter of these works.

Situation and layout.—These works are situated near Jhinjhuda port at a distance of about 6 miles from Navlakhi on the northern coast of Saurashtra. A set of automatic sluice gates has been constructed and a pumping set has been installed to control the circulation of brine. The works have not yet been laid with any track line for the storage of salt. However, they manufactured about 78,000 maunds in 1952 and since then they have suspended their activities due to financial and other difficulties. They did not resume their activities during 1953 and 1954. The salt produced in 1952 was washed away during the monsoons.

(20) *The Gohilwad Salt and Chemical Works, Ltd., Bhavnagar*

History.—Shri Ratilal D. Patel of Bhavnagar obtained on lease about 4,200 acres of *Kharaba* land lying on the southern coast of Gulf of Cambay in Gogho Mahal in Amreli District of Bombay State, in 1951 for purposes of salt manufacture and a licence for the same was issued to him by the

Government of India. This land had been given on lease by the owners, the Mul Girasias in August, 1951; but the same was subsequently held as illegal by the Bombay State in view of the Talukdars' Tenure Abolition Act, 1949, which applied with effect from 15-8-1950. At the instance of the Bombay Government, the licence issued to him was withdrawn. Subsequently, however, the Bombay Government agreed to lease the said land to Shri Ratilal D. Patel for the same purpose and the licence has been issued—the acreage being still undecided. Shri Ratilal D. Patel has since formed the Gohilwad Salt and Chemical Works, Ltd., Bhavnagar, as a private limited company to run these works.

Situation.—This land is situated near village Avania in Gogho Mahal of Amreli District of Bombay State at a distance of about 6 miles from Bhavnagar of Saurashtra State. The works have since taken up the earthwork and sluice gates are under construction at present. Most of the earth work in connection with the construction of reservoirs, condensers and crystallising pans is being completed. The works have already requested for release of necessary tonnage of iron and steel to enable them to lay 2/ gauge track in their salt works. The works have not yet decided whether they should construct their own jetty or the new port Bhavnagar should be used for shipping purposes. No pumps have so far been installed. The construction of the salt works has been considerably delayed because of the stay, order of the Bombay State as referred to above.

Production.—The works are still under construction and their potential capacity will depend upon the acreage that they harness for this purpose. All their produce will be meant for export by sea, local sales being negligible.

(xi) *Salt Administration—Old and Present.*—Till the integration of the different maritime and inland States in Saurashtra and Kutch States, no significant separate Salt Department to administer salt existed in any of the States and the observance of the obligations of the Agreements which the States had entered into with the British Government were being attended to by revenue departments. In Dhrangadhra State, however, from 1922-23 they had a separate Commissioner for Customs and Salt, and a Salt Revenue Officer to attend to matters relating to production and distribution of salt in and outside the State. None of the States had enacted any salt laws. In Junagadh State, the State monopolised in 1944 the distribution of salt in the State and had opened licensed salt depots at all the important towns where salt was distributed at controlled prices directly under the State's control and they had posted clerks at these depots for this purpose. After the integration in 1948 of the various States into the United States of Saurashtra this Government started a separate Salt Department under its Ministry of Industries and Commerce, and a gazetted post of Salt Officer, with headquarters at Dhrangadhra, was sanctioned, with Assistant Salt Officers at Jamnagar, Junagadh and Bhavnagar this salt organization was essentially meant to recover the rents and royalties from the salt works. The Dhrangadhra salt staff was in 1949 made responsible for the movement of salt by rail in accordance with the Central Zonal Scheme of 1949, when a separate zone was allotted to the Dhrangadhra salt works. In November, 1949, the Saurashtra Government issued the Saurashtra Salt Dealers' Licensing Order, 1949, according to which wholesale and retail dealers of salt were licensed in all parts of Saurashtra State and the sale prices of salt were controlled. This Order was issued under the Saurashtra Essential Commodities and Cattle (Control) Ordinance, 1948 (Ordinance No. XVIII of 1948).

The Kutch State did not have a separate salt department and the local customs and port departments continued to recover royalty and rent charges from the United Salt Works and Industries, Ltd., Kandla.

With the Financial Integration of States from 1-4-50, the Central Excise and Salt Act, 1944 was applied to the States of Saurashtra and Kutch, as a sequence of which Government of India took over the salt administration in these States, and an Assistant Salt Commissioner was posted, with headquarters at Jamnagar, with jurisdiction extending to the Saurashtra and Kutch States and to the Amreli District of Bombay State, which lies in Kathiawar. The Kathiawar possessions of Baroda State were merged in Bombay State from 23-5-49, and the only salt works in this area, the Tata Chemicals Ltd., Mithapur, were placed under the control of the Assistant Salt Commissioner, Kharaghoda, till the Jamnagar Division was created from 1-4-50. Accordingly a cess of Re. -/2/- per B. maund was levied on all issues of salt with effect from 1-4-50 and the inland salt works have opened accounts-current with the Superintendent of Salt, Dhrangadhra and so have done the maritime salt works with the Assistant Salt Commissioner, Jamnagar. The Saurashtra staff working on salt administration was taken over by the Central Government from 1-4-50 on their existing pays and terms of service etc. as, in accordance with the Financial Integration Scheme, all staff concerned with assets and liabilities in connection with the administration of salt were to be taken over by the Central Government. No fixed assets were taken over. The staff taken over consisted of one Salt Officer, 3 Assistant Salt Officers, 4 Inspectors, 17 Clerks and 13 peons. They have been absorbed against equivalent posts of Superintendent, Inspectors, Clerks and Peons respectively in the Salt Department.

The present strength of the staff of this Division is as follows:—

Assistant Salt Commissioner.	1
Superintendent of Salt	1
Deputy Superintendents of Salt	2
Head Clerk	1
Inspectors of Salt	18
U. D. Clerk	1
Steno-typist	1
L. D. Clerks	17
Havildars	2
Sepoys	35

The Superintendent is posted at Dhrangadhra and is responsible for the distribution of salt from the Inland Salt Sources. Inspectors of Salt are suitably posted at all the works to supervise the production and issues of salt and recovery of cess charges, etc.

CHAPTER XIII

TRAVANCORE-COCHIN SALT SOURCES

A.—HISTORICAL

1. *Travancore*.—Manufacture of salt has been carried on in Travancore from very early times. There is evidence of salt pans being worked and taxes on salt being collected in South Travancore (at Variyur and Manakudy) even before the 11th Century A. D. (*Vide Travancore Archaeological Series, Volume I, pages 164 and 247.*)

Two stone inscriptions found in the Old Variyur Salt Factory show that the salt factories existed over a thousand years ago. The inscriptions show that in those remote periods the salt factories as well as the surrounding territory were under the kings of the time of Cholas. One of the inscriptions refers to the reign of the Great Emperor Kulothanga Chola Deva, who reigned between 1070 and 1120. The name of the salt factory is given as "Perakrama Chola Peralam" (Allom Salt Factory). It was only after 1785 that this territory which was still then included within the administrative province of the Southern Pandian Kingdom was left over to the rule of the Kings of Travancore.

About the year 1813 salt trade became the monopoly of Government. At one time in the pre-monopoly period, the whole of salt needed for home consumption was supplied by the ryots of Travancore. Manufacture of salt was at that time, and for long, quite free and unrestricted, subject only to one Fiscal Regulation, that the salt produced should be divided between Government and the ryots in certain fixed proportion.

In olden days salt was mainly manufactured at seaside stations between Cape Comorin and Colachal and on the margin of the backwaters in the Taluks of Trivandrum, Chirayinkil, Karunagapalli and Karthigapalli. The seaside manufactories were known as "Alloms" and the backwater factories as "Padanays". The pans in either were the property of Government or Devaswams or of private individuals.

The output was short of the demand for home consumption; and the deficit was made good by imports from Goa, Bombay and other parts of the country. This was stopped by a proclamation in 1813 signed by Colonel Munro, who was then both Resident and Dewan, by which a close monopoly was introduced and all manufacture by ryots except on Government account was prohibited. The monopoly price was fixed at Rs. 1/1/- per maund for the white salt produced in the southern pans, and at Re. -/11/2 per maund for the black salt manufactured in the northern pans. This was to stop cheap Travancore salt from finding its way into the British territory. Simultaneously a special department was organised for the superintendence and collection of salt revenue.

A more important step in the history of the salt industry was taken under the interportal Convention of 1864-65 by which the duty on salt in Travancore and British India was equalised and the adoption of British Indian selling price of salt agreed to by the State. As a result of the Convention, the salt pans on the backwaters in Central Travancore were closed. The disparity in the rates of selling price of this and other kinds of salt was

so great that to sell it at the same price as the superior quality salt would have been a great injustice to the consumer. The sites of the old salt pans on the backwater side were converted into coconut gardens.

Till this period, the share of ryots and of Government *Kudiwaram* and *Melavaram* respectively had never been uniform. In 1865-66 Government fixed this at 40 and 60 per cent respectively for the pans of private individuals (*kudipathees*) and 20 and 80 for Government pans (*pandara pathees*). Relief was also granted to the manufacturer in another direction. His share, i.e., *kudiwaram*, which had been paid in what were known as Shen-cottah Rupees (an imaginary currency which depreciated the value of his share) was for the first time commuted in terms of Travancore rupees. Government further transferred its right over Government salt pans by sale in favour of private individuals.

In the year 1872-73 another important relief was granted to the salt manufacturers. It had been the practice to withhold all payment of manufacturer's share, i.e., *kudiwaram*, till the salt was finally received into store. This practice was abandoned in 1872-73. Pending final arrangements for the acceptance of any payment for the salt of each season Government decided that 50% of the price of the estimated quantity should be paid in advance immediately the salt was gathered. In 1882-83 instead of payments due to manufacturers being delayed arrangements were made for paying them immediately on the salt being taken over by Government.

In 1887-88 the Salt Department was completely reorganised and Regulation VII of 1063 M.E. (1887-88) was passed for better administration of the salt monopoly. A licence was also granted this year for the manufacture of salt to Messrs Manickom Naidu Company of Madras and they began operations at Rajakkamangalam. The attempt proved unsuccessful and the site was abandoned.

A new factory was opened and the manufacture of salt of the requisite quality undertaken by a company in South Travancore. 120 acres of land near the Thamarakulam Old factory were granted by Government and work started in 1903-04. Government entered into an agreement with the manufacturers by which it had the right to purchase a stipulated quantity of salt on payment of a settled rate of *kudiwaram* (cost price to the producer) and sell it to the public or to levy duty. Under this system, called the Modified Excise System, Government incurred no expenditure except on preventive staff.

The salt produced in these factories was of good quality and superior to that produced in the old factories where all but petty works connected with actual manufacture were undertaken by Government at their cost, and the manufacturers were free from any responsibility of finding buyers, as a result of the monopoly system. This freedom from responsibility tended to demoralize them and they cared more for quantity than for quality. With a view to provide an incentive to produce better salt, it was found necessary to leave the manufacturers again to sell their salt as best as they could. Government therefore proposed to convert the monopoly factories into Modified Excise Factories and with this end in view an enactment was made—Regulation II of 1912-13 which granted power to Government to supervise the working of the factories from start to finish.

In the pre-monopoly period, salt preparation was the function of particular castes and large numbers of people lived on this industry. There was no interference from Government. In course of time the salt manufacturers gave up their traditional occupation and other castes took to salt

manufacture. The manufacture of salt gradually slipped from the hands of hereditary salt workers called Alavans and where they were still engaged in this industry, the engagement is more as paid labourers than as independent proprietors.

The consumption of local salt, gradually increased from 11 to 12 lakh maunds in the year 1920, and 21 to 22 lakh maunds in the integrated Travancore-Cochin State in 1949. Prior to 1889 the produce was only 5.3 lakh maunds, with the result that 50% of the quantity had to be imported outside. But the policy had all along been to go in for this article from outside the State only to the extent required over and above the local produce. Side by side, Government extended the area of the salt culture to increase the outturn in the local salt factories. Questions affecting the development of salt manufacture in South Travancore were given top-priority; all lands fit for salt culture were assigned, and all the portions in Manakudy Kayal belonging to the State Government were leased out to several individuals under specific agreements.

2. *Cochin* (now integrated with Travancore).—The former Cochin State also wanted to start a cottage salt industry and with the help of a salt expert of the British Indian Government a piece of 200 acres of land was selected at Malipuram, five miles from Ernakulam and 4 miles off Cochin. Government spent a sum of Rs. 62,000 for experimental purposes without any fruitful result, due to the short period of manufacture season and intermittent rains. The plot was then leased to new M.O. Thommakutty for a period of 25 years. After the execution of the lease-deed by the present licensee (13-12-1948) twenty acres of land were placed at his disposal for the manufacture of salt in the first stage. The lessee adopted the old method of manufacture but later on he laid out, pans according to scientific methods. Another plot of 50 acres of land was allotted to him and the manufacture is being carried on, in spite of the natural disadvantages of frequent rains in this locality.

In all there are at present 20 salt works under eleven unit factories covering an area of 1,437 acres out of which 864 acres are cultivable and the production in peak years can be expected to reach 20 lakh maunds. About 1,000 years ago the maximum salt produced was only 3 lakh maunds.

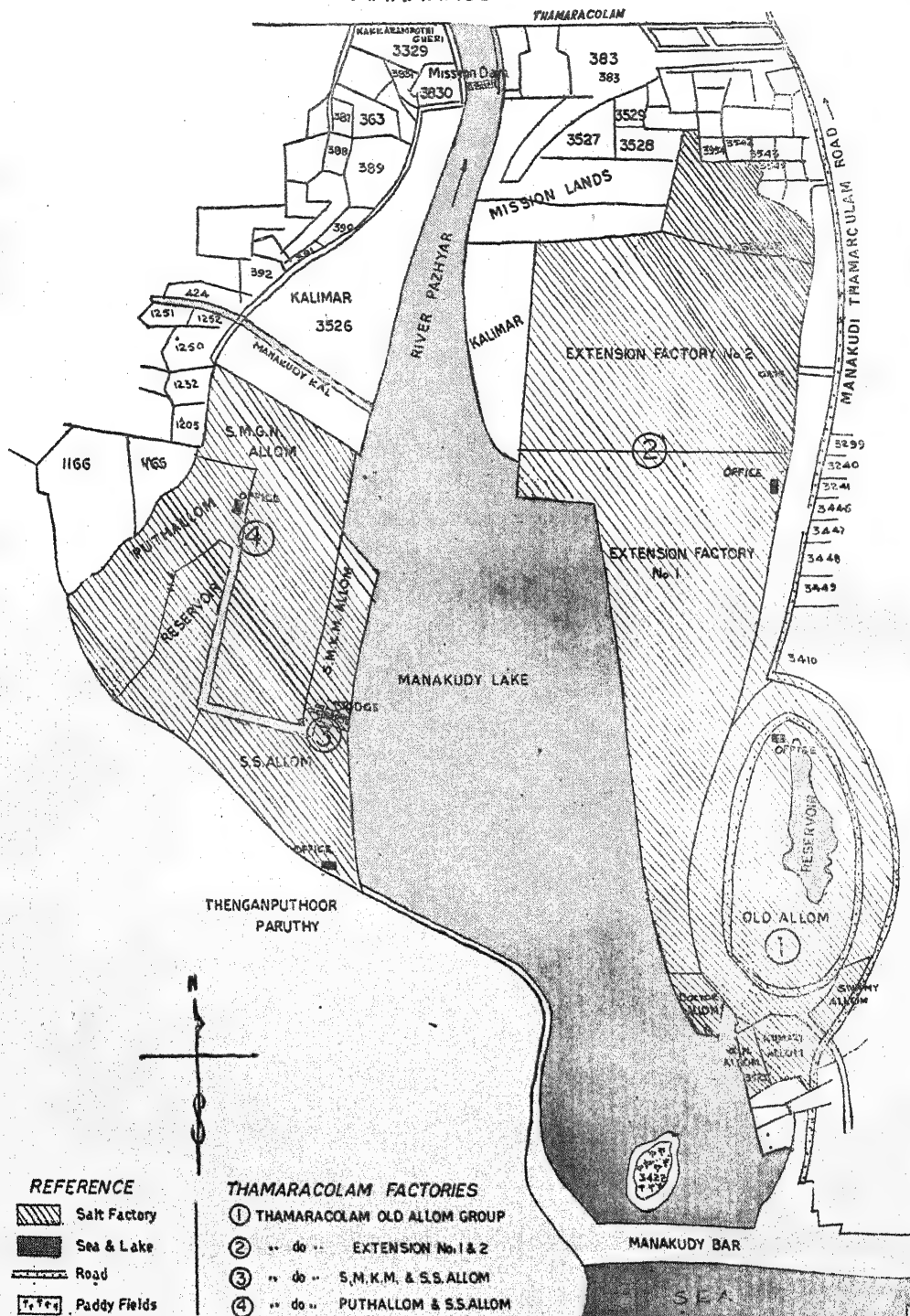
B.—SITUATION, DESCRIPTION, ETC.

Salt used to be manufactured in Travancore on the margin of backwaters known as 'Padanays' and also in some of the factories in South Travancore close to the sea. It was collected in places where lagoons existed. Spontaneous salt was also collected. Salt was also produced by process of solar evaporation. Stumps of paddy plants were collected from the paddy fields and were burnt. The ashes were put in fresh water and after filtering and distilling, the liquid was heated to obtain salt. This practice existed for a long time at Karumagapali and other places in Central Travancore. The salt produced in these places was impure. These pans were subsequently abandoned. In the factories (called Alloms), manufacture of salt was done by solar evaporation.

The old salt works were located one each at (i) Variyur (near Cape), (ii) Thamarakulam (near Manakudy lake), (iii) Rajakkamangalam and (iv) at Colachal (near the sea). The salt beds were very irregular and laid without due regard to levels. The ridges were narrow. The brine channels



MAP SHOWING THE LOCATION OF FACTORIES ROUND THE MANAKKUDY LAKE



too were not properly constructed and many pans were left neglected for want of proper irrigation. The whole of the available area was not utilized and large and high mounds here and there were allowed to remain which meant waste of space. Persian wheels were sometimes used but generally slung baskets were used for lifting brine from the reservoirs into the channels and from the channels into the pan beds. At each of the manufacturing stations, there were two reservoirs—one called the outer reservoir, used for storing sea water, and the other called the inner reservoir used as condenser. At Variyur, there was a channel for conducting the sea water into it; at Thamarakulam, the reservoir was a basin formed at the mouth of the Suchindram river (Pazhayar) and when the Manakudy bar was opened, the sea water was allowed to get into it. At Rajakkamangalam too, the opening of the bar at times was the only means of bringing in sea water and when the bar closed, it caused much trouble. At Colachal, the A.V.M. canal between the salt pans and the sea had to be dammed up on either side for letting in the sea water across it. At Thamarakulam when the supply of water from the sea failed, the water of the estuary was made use of; sometimes brine from brine pits was also used. Owing to defective beds and brine supply, the salt produced was not quite good in quality. Thamarakulam salt which was considered to be the best contained only 75-85% of sodium chloride. This was attributed to careless and slovenly scraping of beds and the manufacturers' effort to show a large outturn without caring for quality. Want of drying ridges and properly constructed platforms was another reason for the inferior quality of salt. The salt was not taken to store immediately. It was allowed to be buried in pits in the pans until it was required for local consumption.

The area under salt manufacture in these four factories was 150 acres. New salt rules were introduced to make provision for an unfailing supply of sea water, proper layout and preparation of beds, embankments, platforms, supply channels, pathways and condensers. The pans were surveyed and an accurate register of holdings was kept by registering transfers by sale, gift or otherwise. The pans were protected alround by strong palisades, or fence and watch towers erected at intervals. Still the location and layout of the old factories is not satisfactory, the brine supply position is inadequate and it is not possible to rectify the defects with the numerous licensees who have been granted licences to manufacture salt according to the old conditions.

In order to develop the salt industry, the State Government of Travancore, in consultation with the P.W.D., assigned lands in the Manakudy lake to several individuals. This lake consists of a large area out of which Government leased out areas according to the requirements of the manufacturers. As a precaution against the danger of the water-holding capacity of the Manakudy lake into which the Pazhayar river discharges itself, Government granted lands for salt culture in this area in such a manner that one group might be worked out into a factory before another plot was assigned. The work of reclaiming the lands for manufacture of salt was taken up gradually. Nevertheless, during the period from 1872 to 1949 the acreage increased considerably and there are now no waste lands worth developing further. A plan showing the Manakudy lake area with adjoining factories is given on the opposite page.

There are at present 20 salt works grouped together into 11 factories, each factory being considered as one unit for the purpose of departmental supervision and statistics. These eleven factories could be classified into three main classes.

A Class—Well developed

(i) Extension No. II called, "The Cape Comorin General Traffic Co.". This factory has the largest output and is one of the best factories in Travancore meeting about 20% of the demand of the State.

(ii) S.S. Allom.—Owned exclusively by Sri Sankara Allom Ltd. The layout of the salt works is ideal and is due to the enterprising spirit of Mr. T. V. Krishna Iyer who has been the pioneer in the salt field in this State. He was the first to introduce use of sub-soil brine by sinking tube wells. The salt produced here is white and pure. Gypsum is also recovered.

(iii) Thattarippuodai Allom.—Though small in size, it is ideal in its layout and manufactures white pure salt having large crystals. The State Government carried on a Model factory in this for a period of 3 years until 31-3-1950. The licensee is still continuing the method followed by the Model factory. It is using sea brine.

B Class—Developed and realigned but still capable of further improvements in quality and quantity

1. S. M. K. M. (Sri Moola Krishnamony Allom).
2. S. M. G. N. (Sri Moola Gopalanathan Allom).
3. Palkulam Salts Ltd.
4. S. C. P. Block I & II (Sri Chitra Ponnallom, Block Nos. I & II).
5. Colachal Salts.

In these factories, the licensees have realigned the pans so as to manufacture pure salt. Of these, Palkulam and Colachal are using sea brine and the other factories are using sub-soil tube-well brine of 4° to 7° Be.

C Class—Undeveloped factories

1. Variyur.
2. Puthallom and Ponnallom.
3. Extension No. I (Aventhanial Allom).
4. S. C. T. M. (Kovalam)
5. Rajakkamangalam Old Allom.
6. Thamarakulam Old Allom.
7. Malipuram (Cochin).

(i) Variyur and Puthallom have realigned pans. The former has not developed the entire area and is working only a very small unit. Puthallom and Ponnallom are very backward since there are no bittern channels or ring channels and scraping is not done generally before 30° Be.

(ii) Extension No. I though situated best, has natural advantages and is capable of producing more salt, but due to fragmentation of the holdings, improved methods of manufacture are not being carried on here.

(iii) Rajakkamangalam Old Allom and Thamarakulam Old Allom factories are labouring under natural disadvantages of fresh water percolation and dearth of brine supply.

(iv) *Malipuram*. The licensee has been granted 70 acres for salt manufacture. Due to frequent and heavy rains and short duration of manufacturing period, the factory is still in dormant state.

C.—MANUFACTURING RIGHTS

1. *Manufacturing rights*.—Up to 1813 salt manufacture in Travancore was free subject to the condition that the salt produced should be divided between Government and the ryots as in the case of paddy fields in proportions varying according to the nature of ownership of pans. In 1866, the share of the ryots and of Government *viz.* *Kudivaram* and *Melavaram*, as it was called, was fixed at 40% and 60% for pans owned by private individuals and at 20% and 80% for pans belonging to the State Government. About this time, Government transferred its right of share in the Government salt pans by sale in favour of private individuals. In 1887-88 a system of monopoly was introduced under licence. Under this arrangement, the licensees were entitled to only 40% of the quantity manufactured and the balance represented Government share. The licensees of the old factories were paid at the rate of $7\frac{1}{2}$ chuckrams ($4\frac{1}{4}$ annas) per maund on the 40% *Kudivaram* share of salt manufactured by them. For the remaining 60% no payment was made and it became the property of the Government. In 1916-17 the above *Kudivaram* rate was raised from $7\frac{1}{2}$ Chuckrams to $11\frac{1}{4}$ Chuckrams ($4\frac{1}{4}$ annas to $6\frac{1}{4}$ annas). For all the new factories under agreements the licensees were paid at the rates varying from $2\frac{1}{2}$ annas to $3\frac{1}{2}$ annas per maund on all salt delivered by them to Government. The *Kudivila* amount for 40% share of the licensees was raised from $11\frac{1}{4}$ Chuckrams to $12\frac{1}{4}$ Chuckrams, i.e. $6\frac{1}{4}$ annas to 7 annas per maund (1 rupee: $28\frac{1}{2}$ Chuckrams Travancore currency). In respect of new factories working under the M.E. System, a uniform rate of $2\frac{1}{4}$ annas per maund was fixed whilst for Avathanial Extension I the rate of $2\frac{1}{2}$ annas per maund continued as per their agreements.

Manufacture of salt in the State is carried on under two distinct systems: (i) Monopoly system and (ii) Modified Excise system.

(i) *Monopoly System*.—The licensed manufacturer under this system was bound to sell to Government the whole of the quantity manufactured at the rates fixed by Government which varied from time to time as per details furnished above. The responsibilities of doing works incidental to manufacture rested with the State Government.

(ii) *Modified Excise System*.—Under the Modified Excise system, the licensees are allowed to manufacture as they like subject to departmental control over quality. But under the conditions of the agreement executed between the licensees and the Government and under conditions of licences in respect of old factories (Old Allom Thamarakulam and Rajakkamangalam) wherein no agreements exist, the licensees are bound to deliver to the State Government before 15th May of every year, Government dues in the shape of salt which vary from factory to factory at a concessional rate of *Kudivaram* fixed by Government in olden days.

In respect of Palkulam Salt Works and C. N. Allom works (under Thamarakulam Old Allom Factory) the licensees are also bound to pay to the State Government 10 per cent of the net profit as per their Income-tax accounts. The licensees are allowed to sell to the public direct the quantity of salt manufactured in excess of the State Government dues on payment of dues in olden days and cess of 2 annas after the abolition of duty.

The licensees are responsible for the maintenance of channels, reservoirs, drying grounds, platforms embankments etc., in good repair. In all the factories excepting Thamarakulam Old Allom and Rajakkamangalam Allom, a ground rent of 6 annas per acre is levied on all the lands worked under licence. At Old Allom and Rajakkamangalam no *karam* (i.e. land tax or ground rent) is levied on the lands wherein proprietary right is said to exist, but a rent of Rs. 5 per acre at Thamarakulam Old Allom and a rent of Rs. 3 per acre at Rajakkamangalam is being collected on platform and drying ground portions which belong to the State Government. Licensees under special agreements may be required before the commencement of the season to sell the whole or any portion of the due salt to the Government at a fixed price. All factories in Travancore State are now working under the Modified Excise System.

From 1-4-50, the Central Excise and Salt Act, 1944, was extended to this State and the existing Travancore Salt Act and Cochin Act were repealed as per clauses 11 and 13 of the Finance Act, 1950, and in accordance with item No. 58 of the Union List under the Constitution, the Central Government took over the administrative control of manufacture, supply and distribution of salt within the State. The Government of India guaranteed the State Government that it was not their intention to interfere with any old agreements or leases which the State Government may have with the existing licensees as regards the payment of rent and royalty in cash or kind. According to this arrangement, the State Government are collecting their share of salt in the factories and selling it in open auction to the highest bidders. In 1950 salt due to the State Government was delivered by many of the licensees, but the majority of the licensees contended that the State Government lease salt (otherwise called as Government dues) did not come under the purview of "Rent or royalty" as per agreements or licences and refused to deliver salt to the State Government. The quantity of salt fixed towards State Government dues was not uniform. The quota was fixed for each area taking into account the outlay involved in the establishment of each factory and the scope for development. The old factories, Old Allom, Ponnallom, Puthallom, Extension I and Rajakkamangalam had to pay more than the new factories when compared with the rate of percentage calculated on the yield of the factory.

Land tenure has to be divided into three groups:—

- (a) Where salt is manufactured on Government lands under specific agreements.
- (b) Where salt is manufactured on private lands under specific agreements.
- (c) Where salt is manufactured on private lands where the proprietorship is said to exist by virtue of a "Neet" granted by Maharaja and where no agreements exist excepting the prevalence of conditions of licences.

Malipuram Factory in Cochin area does not come under the above categories. As per agreement, no salt need be delivered to the State Government.

D.—SYSTEM OF MANUFACTURE

- (i) *Preparation of beds*.—Manufacture of salt is entirely by solar evaporation, and seabrine or high density pit brine is used, though the old

factories at Old Allom, Extension I and Puthallom, use weak brine from Manakudy lake, and Rajakkamangalam factory uses diluted brine collected in the outer reservoir. Sometimes during summer, when brine scarcity is felt, factories situated along the Manakudy lake draw weak brine from the lake. Salt is manufactured by the single irrigation system. Brine is at first stored in outer reservoir from the sea or lake and then conveyed to inner reservoir and condensers from where it is let into crystallizers.

Before the actual manufacture starts the licensees prepare the salt beds by beating or treading them hard with clay, clear off the silt from the brine supply channels, bittern channels and put the ridges and drying platforms in order. During the course of preliminary operations, the floors are made smooth, hard, clean and impermeable. The brine in the inner reservoir is made use of for this purpose, if sufficient brine is not left in the beds. The supply canals, ridges and pathways are also repaired. After repairs, the pans are allowed to dry and are then irrigated with 4 inches of brine from the inner reservoir or brine pits.

Brine from tube wells and shallow reservoirs is pumped by engines whilst brine from the common supply channels and common reservoirs is baled into condenser beds by means of baskets. In old factories and S.C.T.M. (Kovalom factory) where proper layout is not done, brine of 12° to 16° Be. is charged into crystallisers to a depth of 2" and is allowed to concentrate. The crystallising area is in excess of what is actually required and is responsible for low density brine being fed into crystallisers. When a crust of $\frac{1}{4}$ " is formed, the pans are raked with wooden scrapers and the salt is heaped on the ridges of the pans to allow the mother liquor to drain. Bitterns are not eliminated as there are no separate channels for draining them out. They thus contaminate the salt with magnesium salts.

The licensees of Thattarippuodai, Palkulam-Variyur, Extension II, S. M. N. K. and S. S. Allom, S.M.G.N., S.C.P.I., S.C.P. II and Colachal factories which are single license factories where the old process existed, have realigned their pans and increased the condensing area. The problem of bringing all the crystallisers close to the platform has not been found practicable owing to prohibitive cost in complete re-adjustment. They have enlarged the area of condensers and crystallizers and have also made provision for bitterns channels and made proper arrangements to concentrate the brine in condensers and to feed the crystallisers with 23° to 24° Be. They are also eliminating the bitterns after every scraping. S. S. Allom and Thattarippuodai Allom are experimenting in some beds with the system of concentrating brine to a density of 29° Be. and when a crust of $\frac{1}{2}$ " is deposited the bitterns are drained out completely, the pans are charged afresh with concentrated brine of 23° to 24° Be. and the crust of salt is washed in this brine before lifting.

At Thattarippuodai where the model factory existed prior to 1-4-1950, 29° Be. bitterns are let into a second set of crystallisers for separation of crude salt between 29° to 32° Be. All pure salt scraped is stored and any crude salt not coming up to the standard is thrown back into condensers. All factories work on the single irrigation system only under which salt beds are irrigated to a depth of 2" to $2\frac{1}{2}$ " with 23° to 24° Be. until a layer of crystals is formed. This is raked up with wooden scrapers and heaped on the pathway (called ridges) to drain and the bed is re-irrigated with a fresh charge of brine. Crystallising process generally takes 6 to 7 days but 5 to 6 days in the hot months. Salt after drying on the ridges is conveyed to the drying ground platforms.

(ii) *Accretion and Multiple Irrigation system*.—Experiments were conducted in some factories in some special beds selected for manufacture of salt under accretion and multiple irrigation system in 1951. Due to sudden and unexpected rains the accretion system like Sambhar and other places is not worth attempting in this part. The multiple irrigation system gives better results; it is economical and can be tried by all licensees having copious supply of brine during the long season from January to April. This is only a modified accretion system. Brine to a depth of $2\frac{1}{2}$ " is at first let into the crystallisers. When the density reaches 29° Be., these sheets of saturated brine 1" in depth are floated on the salt bed every 5 or 6 days limiting the number of irrigations to three or four, according to weather conditions. These sheets of brine are evaporated one after the other so that salt is deposited in Strata. Salt is then scraped after evaporation of brine after every 3rd or 4th charging. This system is tried only during the hottest part of the season.

(iii) *Brine Supply—Sea Brine and Tube Brine*.—The salt works at Colachal, S.C.T.M. (Kovalam) Palkulam Variyur and Thattarippuodai are all situated on the coast and use sea brine, whilst the Thamarakulam salt works are on the banks and reclaimed basin of the Manakudy lake which is now cut off from the sea by a sand bar and formed into an inland lake into which the flood waters from the southern-most part of the western ghats flow. Formerly, the saline water of the lake was mainly used for manufacture of salt. Its salinity is due to its past connection with sea and the saline soil which occurs at shallow depths. The flood waters have, however, progressively reduced the salinity. Immediately after the floods, the water in the lake is almost fresh but later in the season its density rises to only from 1° to 1.5° Be. at the most. So, the more progressive factories have tapped the sub-soil brine of 4° to 7° Be. which has led to the abandonment of the use of the lake water for the manufacture of salt.

Tube Wells.—In the larger works on the Manakudy lake and at Rajakamangalam factory where the manufacturers are able to get only diluted sea brine, major licensees have sunk tube wells. The method of tapping the subterranean source of brine below a depth of 60 feet is a new feature and has to be welcomed in factories which have a high rainfall and which do not get adequate supply of sea brine of 3° Be. density. The depth of tube wells varies from 60' to 175'. A tube well is sunk to a depth of 60' to 175' depending upon the supply and density of brine. The diameter of the well varies from 2 inches to 6 inches and the brine is drawn by means of centrifugal pumps worked by diesel engines. After trial experiments are made and found successful in tapping sub-soil brine, a small well or reservoir is constructed so as to collect the over-flowing brine. This well is lined with cement concrete rings and its bottom is provided with cement concrete floor. This serves as a storage reservoir.

(iv) *Boring Process*.—A suitable site is chosen for sinking tube wells after testing first that there are no fresh water springs or channels in the vicinity. Generally 2" or $2\frac{1}{2}$ " G. I. pipes are used for casing pipes. For cleaning the inside of the casing, 1" or $1\frac{1}{4}$ " valve pipes are used. At one end of the pipe, a valve is fitted. Casing pipe is first fixed firm in the site and pushed down. One piece of valve pipe is applied inside and pushed up and down. The earth and mud get inside the valve pipe. Water is poured inside the casing pipe and this facilitates entry of mud into the valve. Frequent pushing up and down removes the superstrata gradually. When the inside gets free and empty the casing pipe is easily screwed down, the process is repeated and the casing pipe is further brought down

till soft strata of earth are all removed and the pipe rests on hard surface. Usually hard strata is met with at 40 feet depth. Beyond this depth, no casing is necessary. This valve pipe work is repeated. The muddy water becomes saline when it comes from some depth. If the earth refuses to yield to valve pipe, auger and chisel are attached to the bottom portion of the valve pipe, and the process is repeated. As the depth increases small brine springs ooze out. By repeated motion of the valve pipe, the flow of brine in the casing pipe is tested. If the flow is incessant and unfailing, process of boring is stopped. Testing is then done by suitable engine and pump at the bore spot.

(v) *Density of brine in bore wells.*—Usually if bore wells are sunk in the proximity of sea it is found that the density of the bore springs ranges between 3° and 7° Be. In some places still higher degree brine is available.

Experience shows that tube wells gradually deteriorate in the course of 7 to 10 years in regard to both the volume and density and brine, when they are abandoned and fresh wells are sunk. Although the initial capital cost of sinking a tube well and subsequent replacement by fresh tube well is a bit high, the manufacturers welcome this as the yield is much greater. Some factories are in favour of using tube well brine and supplementing it by sea brine. The cost of sinking tube wells depends on the diameter of the bore and the depth.

(vi) *Improvements for increasing the output.*—In the year 1933, the Industrial Chemist attached to the State Government was deputed to study the conditions of old factories with a view to increasing the output and improving the quality. After studying the conditions in the factories at Thamarakulam Old Allom, Rajakkamangalam Old Allom etc. he found that these salterns which produced large quantities had very much deteriorated and mostly abandoned and looked like a swamp flooded with fresh water. This was mainly attributed to:—

(a) A very large number of licensees who held the pans failed to improve the salterns.

(b) The deterioration of the pan beds consequent on the percolation of fresh water which ruins the beds, dilutes the brine and delays concentration.

(c) Inadequate supply of good brine sufficient for irrigating the pans and of quality good enough to ensure a rich crop of consumable salt.

His proposals for improving the brine supply at Thamarakulam Old Allom could be summed up as follows:—

(1) To pump sea water direct from the sea. This necessitates avoiding the flow of sand into the pipes and pumps, laying a pipe about 200 feet right into the sea, the pipe itself being supported on a pier to be built in the open sea. The pump may be installed at the pier-head or on the foreshore. The pumped water may either be fed direct to the reservoir belonging to individual lessees or through an intermediate storage tank.

(2) Another way of getting sea brine is to sink a few wells on the foreshore close to the sea and either take the water that fills the wells by percolation through the sands or by a pipe for each well, about 50 feet into the sea and let the water into the wells. The sand that is likely to be collected in the wells may have to be removed regularly.

(3) There is yet a third way, and that is to cut a channel from the sea into the Manakudy lake sufficiently deep and wide by dredging, and having done that, to keep the channel open throughout the year. This will ensure maintaining the water in the Manakudy lake always at the same degree of salinity as the sea itself. The supply will be steady and unfailing. The one advantage of this method is that it might keep the bar always open, in a way solve the problem of the disposal of the flood waters of the Pazhayar, prevent silting up of the river beds and save the fields in the upper reaches from getting submerged and damaged. This is, however, a big question requiring a close study of the local conditions. For this scheme, a dredger has to be got down and the channel kept dredged and open all the year around. The capital outlay on such a scheme is estimated to be nearly 2 lakhs of rupees.

In deciding upon one of the three methods the initial cost, subsequent maintenance, depreciation on machinery and capital works, and interest on outlay have all to be taken into account.

The second proposal is not worth attempting due to the regular sand nuisance at the sea coast. The scheme of taking brine from the sea which is close to the Manakudy lake about $\frac{1}{2}$ a mile, wherein the shore is sandy by constructing a pier and by having a floating pipe system as in the case of Tata Oil Company at Ernakulam is preferable and this is engaging the attention of the Salt Department. The third proposal is also worth consideration. To supplement the tube well areas, the question of supply of sea brine has to be considered so that brine supply scarcity keenly felt in the Thamarakulam Old Allom, Extension I and II and Puthallom can be easily solved and the output increased.

Similarly, Rajakkamangalam factory is labouring under the same difficulties of brine supply. The State P.W. D. attempted several schemes but all of them failed. The Salt Department has suggested a pipe line from Muttam rocky portion in the sea to a distance of 2 miles to convey sea brine to the factory's outer reservoir beyond the portions which are flooded by fresh water and putting up of strong bunds to stop fresh water percolation. The cost may roughly come to Rs. 2 lakhs. This scheme has been included in the proposals for Development.

Another method under contemplation is the formation of a co-operative society by the licensees of Old Allom at Thamarakulam by consolidating all their holdings. If and when all these major schemes come out successful, the potential output of all the factories may reach 20 lakh maunds.

E.—SEASON FOR MANUFACTURE AND EFFECT OF RAINFALL

(i) *South Travancore*.—There are two manufacturing seasons here. The intervals between the closing of the north-east and the setting up of the south-west monsoon, and similarly the closing of south-west monsoon and the setting up of north-east monsoon. The first is known as Thai pani (pani means season) commencing from the 15th January and going up to the 14th August; and the second as Purattasi pani extending from the 15th August to the 14th January. Manufacture generally lasts for five months in the first season and two months in the second season. The dates of commencement and closure depend on rainfall. There is generally cessation of

rains after the end of November. The working season and preliminary operations begin in December. This area can be divided into four divisions:—

- (a) Cape Factories . Thattarippudai, Palkulam-Variyur and S. C. T. M. (Kovalam). 18 to 28 inches of rainfall least rainfall 6 inches.
- (b) Manakudy lake factories. Thamarakulam Old Allom, Extension S. M. K. M. & S.S. Allom and S.M.G.N. and Puthallom. Average rainfall 21 to 36 inches.
- (c) Rajakkamangalam and Colachal. Heavy rainfall—27 to 51 inches.

North Travancore-Cochin—

- (d) Malipuram . Very high rainfall—100 to 122 inches.

The season is peculiar in South Travancore and varies from factory to factory.

Manakudy Factory and Cape.—During the months of December and January there are scanty rains with drizzles at intervals, but with hot and bright sunshine, when regular scrapings take place. In February, slight rains occur whilst March is the best part of the season with no rains. Again April and May months bring in rains at intervals. From June to 15th August, manufacture is retarded due to rains though occasional scrapings are done in factories by the licensees who adopt scientific method of manufacture and who are able to store concentrated brine.

Second season—Purattasi pani.—Regular manufacture is carried on up to 15th October only, when south west monsoon (Thulavarsham as it is called here) begins. During October and November rains are comparatively heavy in these parts as compared with North Travancore. During the second manufacturing season evaporation is quickest and percentage of yield is greater. Normally the proportion of yield is 2:1 for the long season and the short season. This phenomenon is also due to wind velocity.

(ii) *Meteorological Data at Cochin.*—(a) *Season*—The only period available for salt manufacture is from the second half of November to the end of April, four months is the very maximum. The rainfall is quite heavy. It takes 3 to 4 weeks in preliminary operations which reduces the actual period of manufacture to about $3\frac{1}{2}$ months.

The maximum temperature, from November to May remains about 91° and the minimum about 83°. Humidity varies from about 65% in January to 90% in June. Average wind velocity is from 4 to 6 miles per hour in the months of the salt manufacturing season. The Meteorological conditions are not very favourable.

F.—QUALITY

The necessity for improving the quality of salt was felt as early as 1933, when the Industrial Chemist was asked to carry on experiments in manufacturing salt for improving the quality. He started his experiments in the Thamarakulam Old Allom. As a first step an area covering 16 pans was taken up. The result showed that the poor quality of salt was due to the poor quality of brines which are rich in other salts, such as magnesium

salts. His main suggestions were regarding the supply of sea brine which could produce salt of a purer quality, elimination of bitterns at frequent intervals and proper lay out of pans by raising the pan level. In the meanwhile, the Government gave permission to Mr. K. R. Krishna Ayyar, Professor of Chemistry, Trivandrum to conduct further experiments. His experiments were tried in two factories, (i) The S. S. Allom where pit brine was used and (ii) the S.C.T.M. factory where sea brine was used for manufacture. They were in respect of improved method of scraping, drying and storing of salt and his method was to produce white salt free from insoluble impurities and containing the least percentage of calcium and magnesium salts. He also conducted analysis of different samples of salt.

He conducted laboratory and field experiments on the solar evaporation of sea water and tube well brine and evolved a simple, efficient and economic method which yielded common salt of high purity and by-products like gypsum, magnesium sulphate, mixed salts and concentrated bitterns.

A summary of his conclusions and suggestions is given below:

1. There is every possibility of improving the quality of salt manufactured in these factories.

2. Method of improving the quality of salt without any drastic change in the method of manufacture has been found economical.

3. The smaller condensers could give brine at 12° Be' to feed the crystallisers whilst under the new method concentrated brine of 22° Be' to 24° Be' could be got very easily at an economical cost.

4. The scientific and economic layout of the salt pans with sufficient space for condensation for the kind of brine used according to the initial density available and the method for the purpose has been explained.

5. Comparative results show the method of scraping, in the same yield of salt, giving quality very much superior to what had till then been manufactured.

6. The accretion system was found to give a similar quality but was considered unsuited as unexpected showers in these localities destroyed the accumulated crops.

N.B.—Recent experiments of the Salt Department in 1951 also proved that the accretion system tried on the lines adopted at Sambhar lake is not successful in these localities.

7. Deterioration of these pan beds in Old Allom and Puthallom accounted for (a) salt not crystallising out in these alloms at 25° Be' but crystallisation getting delayed often beyond 30° Be' and (b) for the poor quality of salt manufactured in these places. Principles were evolved for renovating them.

8. The new process of scraping salt could eliminate the impurities at every stage without corresponding reduction in quantity.

9. The elimination of bitterns after every scraping improves the quality.

10. There is the possibility of scraping by-products for the waste bitterns after waste mixture of salt obtained by the evaporation of bitterns and the concentrated bitterns left at the end.

11. Suggestions are given for utilising the waste mixture for manufacture of potassium sulphate (or chloride) and magnesium sulphate and the concentrated bitterns for the manufacture of bromide and magnesium chloride.

12. Method of collecting gypsum and refining it for industrial purpose is also explained.

13. In order not to diminish the yield, a method has also been suggested to have one set of crystallising pans to be scraped at below 29° Be' and to have a second set of crystallisers for transferring the bitterns of 29° Be' and for scraping crude salt between 29° and 32° Be. It is also proved that between 28° and 30° Be' the yield of NaCl (sodium chloride) is only 10% and this yield of the total and the increase in yield of 10% is made at the expense of considerable lowering in the quality. In the new process provision has been made for scraping extra 16% of common salt at 32° Be. This crude salt if washed in concentrated brine and if found to be up to the standard of purity fixed, can be issued for human consumption and if it is not up to the standard it may be scraped and dumped into the condensers as it enriches the brine and this is permissible.

Model Salt Factory.—As a result of experiments conducted at the laboratory and field for a period of over 7 years under the Travancore State Research Department, the State Government opened a Model Salt Factory at Thattarippudai Allom in the year 1946 with the following objects:—

(a) To induce the manufacturers to adopt scientific methods so that better salt and by-products may be made available.

(b) To have pilot experiments for the production of gypsum with a purity of 97% to 98% so that the manufacturers may be induced to collect this separately instead of allowing to get it mixed with common salt.

(c) To start experiments for recovery of potassium salts necessary for matches, drugs and fertilisers.

(d) To conduct small scale experiments on the new uses of concentrated bitterns for purposes of water purification, preventing dust nuisance and hardening the road and to find out as to whether this would be profitable on a commercial scale.

This Model Factory was started in 1946-47 and it continued up to 31-3-1950 when it was abolished since the Centre took charge of the salt administration.

According to the terms of the lease of the Government Model Factory, half of the yield of common salt and crude gypsum were to be given free of cost to the lessees of Thattarippudai factory. The period of the lease expired on 31-3-1950. The Travancore Government were running the Model Salt Factory at the State expense with the Director of Research as the administrative head. The functions of the incharge were to demonstrate the salt production to all the licensees in the University method at the Model Salt Factory and also to visit other factories, to do propaganda work for the manufacture of pure salt and to advise the licensees in the matter of layout and operational details.

During 1946-47 to 1949-50 the State Government sustained a loss of about Rs. 25,000/- to 30,000/- each year on working the factory owing to the fact that 50% of the yield was given to the owner of the land and brine supply charges were high. The cost of manufacture was also high and worked out to about Re. -/14/- per maund.

G.—DRYING AND STORAGE OF SALT

Prior to 1906 it was the practice to collect salt from the beds, to bury it in pits or store it in irregular heaps on the banks of the pans. This salt was afterwards weighed and stored in the Government store houses. The salt when received into store was thrown into one large irregular confused mass in a covered building (store house) and it was impossible to ascertain the quantity in store. Rules were then changed on the passing of the Salt Act and the system of accounting was changed. After the salt was scraped, it was allowed to dry on the ridges for 3 or 4 days and was then removed and dumped into drying ground for 3 months. From the drying ground it was transferred to storage platform where after weighment it was made into of heaps 1,200 maunds or so and thatched with *cadjan* leaves for protection against rains. Gradually in 1949, the system of weighment for storage was discontinued in respect of factories which adopted the scientific method of manufacture. The system of estimation by measurement was adopted.

After 1-4-1950 this system of heaping the salt in one place and then retransferring it to another platform after weighment was discontinued as it meant double handling. The licensees are in favour of the system of drying salt on the ridges and storage of dried salt in the spaces. The system of storage and sale in bags has been introduced after the Centre took charge. This bag storage system is now popular with the licensees and merchants here as it enables them to dispose of their new season's crop quickly without much expense on storage.

H.—PRODUCTION

The output of salt from Travancore factories has varied from time to time. From 1870 to 1925, it varied from 2 to 6 lakh maunds. From 1925 to 1930 it varied from 6 to 9 lakh. The output was low during the years of heavy rains. Figures from 1930 onwards are given below:—

Year	Output in thousand maunds
1930-31	1,011
1931-32	1,163
1932-33	744
1933-34	871
1934-35	1,711
1935-36	1,339
1936-37	1,752
1937-38	1,257
1938-39	1,733
1939-40	2,087
1940-41	1,603
1941-42	1,478
1942-43	978
1943-44	1,752
1944-45	2,379

Year	Output in thousand maunds
1945	1,715
1946	1,553
1947	1,633
1948	2,357
1949	1,957
1950	1,447
1951	1,748
1952	1,736
1953	1,613
1954	1,341
1955	1,573

The output was poor up to 1933-34 as all factories were till then in the development stage only. From the year 1934-35 all factories doubled their efforts to manufacture salt and went above the target of 17 lakh maunds. Floods caused damage to the factories around Manakudy lake. The question of desilting up the Manakudy lake and drainage of the Pazhayar river was considered by the State P.W. D. but they were not able to make any permanent arrangement. The Chief Engineer P.W. D. came to the conclusion that the flooding was not due to silting up of canals but due to (1) the absence of sufficient lake areas as a basin to receive the flood water and (2) early opening of the bar. By arranging sufficient labour in time, the bar could be cut at the moment the necessity for it arises and that if a wide-cut is promptly made, flood damages can be avoided in future. During 1951, due to heavy rains and sudden floods, the water level in the lake rose up to the brim of the platform of S.M.K.M. and S.M.G.N. Alloms and the licensees took timely action in cutting open the bar and avoided the catastrophe.

During 1934-35, target of 17 lakh maunds was reached in spite of scarcity of brine. Again the year 1937-38 was not favourable. However, this deficiency was made up during the years 1938-39, and 1939-40 when there was a bumper crop. About 1943 the quota system of distribution of salt was introduced. Therefore, there was a tendency on the part of some of the licensees to inflate the production figures.

During 1950 the second part of the season was a complete failure due to unexpected and continuous rains for several days. This accounts for the poor yield in that year. At present, the manufacturers are allowed to scrape as much salt as possible and increase the output.

I.—COST OF PRODUCTION

The cost of manufacture of salt at Travancore salt factories varies with the locality, size of the factory, rate of yield per acre and the mechanical appliances employed. It increased gradually from 3 to 4 annas per maund before 1935, to 4-5 annas during 1935-40 and to 8 annas to 12 annas during 1948 to 1952 owing to increased cost of material and labour. The various items going in the cost of production are:—Reconditioning pan area,

repair to ridges, puddling and tamping of beds; irrigating the pans; cost of scraping and removal of salt to the drying ground, storing materials *cadjan*, etc.; cost of working the engines and general *Maramath* (repair to platforms etc.); tools, appliances etc.; and overheads.

J.—SYSTEM OF DISTRIBUTION

In olden days salt was transported to the six store houses noted below:—

1. Thamarakulam	}	Factory store-houses.
2. Colachal		
3. Trivandrum	}	Depot store-houses.
4. Quilon		
5. Alleppy, and		
6. Munambam		

The transport of salt was by carts to the depots near the pan area and by country crafts to those located in distant places. Transport by sea took place in November after rains and continued up to April and this was done through the contractors. From these store-houses, distribution of salt was made to the selling depots otherwise called bankshalls. This was done entirely at the expense of the Government. There were 49 bankshalls in olden days, and they used to keep in reserve a month's supply. The old arrangement of drawing supply by bankshalls was found unsatisfactory as several frauds occurred. From 1905-06 salt was permitted to be sold from the factories and coastal depots direct to the wholesale dealers, and most of the bankshalls were abolished.

The balance requirements of the State were imported from Bombay at the cost of the Government, contractors being engaged for transport, and was stored in the Government depots and store-houses and sold by Government at a fixed rate. The supply of the salt required for consumption in the State was obtained partly from factories and partly by import and sold through Government agencies excepting at Munambam salt depot where a contractor was engaged for transport and supply of salt.

Bombay salt was allowed to be exported from the salt works in Bombay to Cochin and Travancore States on the recovery of a special reduced rate of 3 pies per maund only under the Convention of 1865 between the Government of India and the two States. Salt was supplied to Travancore and Cochin at the special reduced rate of three pies per maund. From 1865 Madras also supplied to this State from Tuticorin factory whenever needed at a nominal duty of 3 pies per maund, under the terms of treaty.

To develop the traffic in Tirunelvely—Quilon Railway, import of Tuticorin salt by rail was resorted to from 1914-15, the S.I. Rly. having given the concessional railway freight for salt. From the year 1925 the salt from Tinnevely was stored at Shencottah depot which was then opened.

A noteworthy feature occurred in 1929. Till that year the licensees had to pay duty prior to the removal of salt from the factories or sales elsewhere, which involved the investment of a large capital. To help the licensees, the State Government passed a Rule enabling the licensees to remove their salt under bond from the factory to Government depots at Trivandrum, Quilon and Alleppy. By this arrangement, the duty was realized later and

a small cess in addition to cover the establishment charges when the salt was actually sold out from the depots. In addition to the local salt a small quantity of Bombay salt was being imported into the State to meet the demands of the Taluqs in north Travancore. The supply of Bombay salt was gradually reduced from 1934 to 1936 and in 1937 the import of Bombay salt was stopped.

Sale of salt in factories and depots was conducted under quota system on the basis of production and consumption for a period of 3 years and it continued till 5-7-1944 when it was temporarily suspended. It was again reintroduced in 1945 and continued till 20-11-1946. Subsequently free sales were allowed. Travancore manufacturers were given protection by the State Government up to 1950 by prohibiting the import of salt into the State, because the manufacturers were to deliver State Government $3\frac{1}{2}$ lakh maunds of salt out of an average production of $17\frac{1}{2}$ to 18 lakh of maunds i. e. $\frac{1}{5}$ th of the salt produced, and the State Government were also getting revenue by sale of their own salt at a flat rate of Rs. 1/4/- per maund ex-factory. Import and export of salt to Travancore and Cochin were prohibited with reference to section 34 of the Travancore Salt Act and Rule 80 of Travancore Salt Rules and Cochin Salt Act 1083 M.E., which were in force up to 1-4-1950. By the Indian Finance Act of 1950, all the above State Acts and Rules were repealed and the Travancore—Cochin State Government had no powers to issue any legislation after 1-4-1950 since salt was included in the Union list.

Since Rule 80 of the Travancore Salt Rules is no longer in force after 1-4-1950 free import of salt is allowed. The local manufacturers were against any free import of the salt into the State as it indirectly affected the local industry. Due to low production in Travancore Factories, import from the neighbouring States is unavoidable and was permitted from January, 1951. Under the Zonal Scheme import is allowed to the extent of actual requirements only. As the Zonal Scheme does not control movements of salt by sea, it was not possible to restrict such transport by sea from Tuticorin or Bombay into the State.

Zonal Scheme—by rail—There is no railway traffic from any of the factories at Travancore. The Travancore salt sources are included in the Madras Zone. A quantity of 2 lakh maunds alone was permitted to be moved by rail from Madras State to Travancore i.e. excluding swamp salt by rail.

The distribution of salt in Travancore-Cochin is a complex problem. The sources of supply are irregularly placed. The inland areas are situated at a great distance from the source of supply and cannot be economically supplied as the supply here is only by road and expensive when compared to Tuticorin which has the facilities of railway siding, port, easy connection by rail etc. Due to high cost of transport, Travancore salt is unable to compete with Tuticorin salt. Tuticorin and Bombay export salt to Cochin port by sea besides transport by rail and road. Considerable quantities of high purity salt are also being supplied to Cochin from Saurashtra and Kutch for a chemical factory at Alwaye.

K.—SALES

The factories are sufficiently protected. In olden days they were guarded by a force of armed peons. Even after abolition of duty the State Government kept the same system of guarding. Gradually, the licensees have themselves been induced to protect their salt.

Each factory is supplied with standard maund weights and cup scales for weighments, another for check weighment of 15% of salt bags before removal from the factory. Formerly the salt was issued from the heap after weighment and 15% of the number of bags were checkweighed before the consignments were allowed to pass out.

After the Centre took over all these rules were gradually relaxed. As in Madras and Andhra, the licensees/merchants are themselves allowed to weigh the salt with occasional checks by officers.

Salt is ordinarily sold to wholesale dealers from the factories. Up to the year 1946-47, transport was done in bullock carts. Transport is now done in lorries up to Trivandrum and then in small boats to other parts though in olden days country crafts were used. Up to 1-4-1950, salt was transported by sea in country crafts under the 'bond system' to coastal depots. From 1-4-1950, the bond system was discontinued. Most of the salt works in Travancore are located close to the sea coast. One of the salt works (S. M. K. M.) has no approach road. Salt has to be transported through backwaters, then unloaded and transported by headload to the road side. The nearest railway station is about 50 miles from the factory, and cost of transport by lorries and carts to railway station is appreciable. It is possible for the factories around Manakudy lake to export salt to any coastal place in the Indian dominion from the Manakudy port if it is developed. This port was used only prior to 1-4-1950 for transport of State Government salt by the contractors to the several depots and also private licensees/merchants for 'under-bond' transport to their depots. At present, there is no difficulty for direct inland transport by lorries.

The Central Government dropped the idea of establishing salt depots in the State and allowed the traders to have free trade. The State Government have gradually disposed of their depot buildings. The nominee system is not in vogue here. The salt passes into consumption by direct issues from the factories. The licensees and merchants transport the salt bags to Nagercoil (Kotar) and distribute them to other places by lorries and vallams (small vessels) from Trivandrum.

L.—DISTRIBUTION

The annual salt production in Travancore and Cochin factories is about 13-14 lakh maunds. The annual consumption of the State is about 23,00,000 maunds and the deficit is supplied from Madras and Bombay factories. The figures of actual distribution from the home industry and of imports from Madras and Bombay for the last 10 years are given below:—

Production and Consumption in Travancore and Cochin States

(Figures in thousand maunds)

Year	Production			Consumption in Travancore and Cochin State	Imports from outside	
	Travancore State	Cochin State	Total		Madras factories	Bombay factories
1945 . . .	1715	..	1715	1650	..	..
1946 . . .	1553	..	1553	1857	..	..
1947 . . .	1633	..	1633	1900	..	..

Year	Production			Consumption in Travancore and Cochin State	Imports from outside	
	Travancore State	Cochin State	Total		Madras factories	Bombay factories
1948 . . .	2357	..	2357	2097	..	..
1949 . . .	1956	1	1957	2263	..	..
1950 . . .	1447	4	1451	2123	7	..
1951 . . .	1748	14	1762	1900	339	61
1952 . . .	1736	21	1757	1660	251	69
1953 . . .	1613	26	1639	2061	521	114
1954 . . .	1341	18	1359	2312	377	224
1955 . . .	1539	34	1573	1842	163	..

Duty free issues.—The total issues include the quantities sent direct from factories for industrial purposes and manure purposes. This quantity is negligible. Fish curing yards had not taken more than 21,000 maunds of salt at any time and 2,000 maunds are issued for tile works, tanning leather and manuring coconut trees. After the abolition of duty these concerns also purchase salt in the markets.

Duty free salt issued for tile works was by denaturing it i.e. by mixing kerosene oil by 1.5% and for leather by mixing bleaching powder by 1% and in some cases by mixing 5 parts of *Illuppa Punac* to every 100 parts of salt.

M.—SELLING PRICE

Under section 33 of the Travancore Salt Act, the State Government had powers to fix the minimum price at which salt from the factories could be sold, and they also fixed wholesale prices in several depots. The price varied from time to time. In 1931 the price of salt (including duty at the rate of Rs. 1/9/- per maund) was Rs. 2/3/-, Rs. 2/5/- to Rs. 2/7/- and Rs. 2/10/- for the local salt, Tinnevely Depots salt and the Bombay salt respectively. The prices for the local and Tinnevely Depot salt rose to Rs. 2/6/- and Rs. 2/7/6 to Rs. 2/14/- per maund in 1943. After the abolition of duty in 1947, the price of local salt fell to Rs. 1/7/6 and that of depot and Bombay salts to Rs. 2/1/5 to Rs. 2/12/- and Rs. 2/7/- to Rs. 2/14/- per maund respectively.

From 1-4-1950, the Central Government did not impose any minimum or maximum price control. Trade was allowed to adjust itself with the result that the ex-factory price came down. With the import of Tuticorin salt and the auction of State Government salt, the old monopoly price came down to a normal level, and average wholesale price per maund was Rs. 1/1/6 in 1950-51 against Rs. 1/4/- in the previous year. The prices now-a-days (1955) range between Re. -/14/- to Re. 1/-/- according to quality of salt available in each factory.

Prices for Government salt in depots were fixed on the basis of ex-factory price adding the transport charges and the charges on wastage, etc..

With the free import of Tuticorin salt, prices of salt in the markets have fallen and the merchants find it difficult to push Travancore salt in the markets in competition with private salt from Tuticorin which is cheaper and is transported by rail, road and sea. Besides the low prices of Tuticorin salt, the good quality of the gunny used by Tuticorin and Bombay merchants for transport of salt attracts the wholesalers, since they save 4 annas to 8 annas per gunny by resale or reuse of the same.

N.—RECOVERY OF BYPRODUCTS

Mixed salts.—These were also manufactured by the Research Department on an experimental scale in the S. S. Allom and S.M.K.M. Alloms. As this work was done in the interest of the licensees, the cost of the special staff was recovered from them. The main object of manufacturing mixed salts was to get potassium chloride. But the result of analysis showed more percentage of sulphate and the company who desired to purchase it dropped the idea.

Quantities of crude salt manufactured by the Model Salt Factory are as noted below:—

1946	. . . . .	230	maunds.
1947	. . . . .	1,180	maunds.
1948	. . . . .	1,422	maunds.
1949	. . . . .	1,498	maunds.

As it contained more percentage of sodium chloride, it was issued for human consumption.

(a) *Bitterns.*—As a result of the experiments made by the Research Department, it was found that the bitterns in the salt factories could be used for the purification of water instead of alum. The following quantities of bitterns were delivered to the water works:—

1943-44	. . . . .	9,088	gallons.
1944-45	. . . . .	21,000	gallons.
1945-46	. . . . .	17,180	gallons.
1946-47	. . . . .	20	gallons.
1952	. . . . .	240	gallons.

(b) *Table salt.*—Mr. S. C. Karayalar (S.M.K.M. Factory) was permitted to manufacture Table salt by removing the required quantity of common salt from the factory on the basis of a rebate of duty on the wastage found, limited to a maximum of 15% of crude salt.

From 1943 to 1946 a quantity of 70,876 maunds of crushed salt was manufactured. As there was no regular demand for it, it was stopped in 1946-47. Out of this a quantity of 4,876 maunds was sold on payment of duty of Rs. 1/9/- per maund and 51,652 maunds on payment of cess of 2 annas per maund, the duty having been abolished in 1947.

(c) *Calcium sulphate.*—At present three factories, S. S. Allom Ltd., Thattarippuodai and Palkulam Salts are collecting gypsum every year. The method of collection and washing by the first two factories is given below:—

(i) Gypsum is deposited between 12° and 24° Be' and in most cases between 14° and 24° Be'. The brine is evaporated in special beds (pan beds) where the density of brine ranges from 14° to 24° Be'. These pans have firm beds.

(ii) As only a thin layer of gypsum is deposited by each charging of brine all gypsum is collected only at one scraping at the end of the season.

(iii) About one week before the end of the season, the concentrated brine from the pans is let out and about 1" to 2" of brine is admitted. The diluted brine is allowed to stand in the beds for 12 to 15 hours and then let out. Fresh diluted brine is again admitted and the process repeated.

(iv) After letting out the diluted brine the gypsum beds are allowed to dry in the sun for 3 or more days when the deposits of gypsum rises up in flakes. This gypsum is then removed by the metal scrapers without disturbing the beds. The crude gypsum is washed with fresh water to remove the adhering clay and salts. The process is continued till the washing is nearly clear and the gypsum is white in colour. The washed gypsum is dried by some licensees on mats and by some in the cement platforms in the hot sun.

At the Thattarippuodai factory fresh water is taken from a canal (odai) adjacent to the factory and the licensees bring the gypsum by baskets and dry it in the sun. In another factory, S. S. Allom Ltd., the process of washing is done mechanically. The refined gypsum so obtained is again dried for a day or two in separate cement platforms constructed for the purpose.

The analysis of the gypsum samples from 3 alloms was recently done in the India Cements Ltd., Laboratory, Thalaiyuthu (Tinnevely) and showed 96.24% of $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. Investigations made to market this gypsum revealed that Messrs. India Cement Ltd. Thalaiyuthu (Tinnevely) and the Travancore Cements, Kottayam were interested in the use of this gypsum in their cement factories, and both of them required 7,500 tons per annum. (5,000 tons and 2,500 tons). The Fertilisers and Chemicals (Travancore) Ltd., were not interested in the gypsum collected in salt pans on the assumption that it contains more residual NaCl which is injurious to their plant.

At Travancore the greatest handicap is want of transport facilities. The approximate collection and washing charges for a maund of gypsum comes to 11 to 12 annas (*i.e.* Rs. 20/4/- per ton of washed gypsum). But the price offered for pure washed gypsum for delivery in the cement factories is only Rs. 45/- per ton. The cost of transport ranges from Rs. 27/- to Rs. 33/4/- per ton. It is for this reason that the licensees of Travancore are not much interested in the manufacture of gypsum. Royalty on gypsum was levied at the rate of Rs. 2/- per ton, but was waived from 22-3-1947.

O.—PREVENTIVE MEASURES

Besides the elaborate guarding arrangements in and around the salt factories for the protection of salt revenue in olden days, preventive stations and *chowkeys*, one at Alavakarai and one at Anjugrammam were established for the purpose of detaining and examining the consignments of salt removed from the factories. These stations were abolished long ago.

P.—HISTORY OF ADMINISTRATION

In 1882 there used to be one Sirasthadar on Rs. 125/- with two clerks and one Superintendent for each factory with one clerk and some peons besides Superintendents and clerks for the storage and sale depots. Subsequently the Salt Department was completely reorganised and as a first step

of reform it was placed under a Special Officer. The subordinate establishments were reorganised and a Deputy Peshkar on Rs. 300/- per mensem with two Superintendents and one Deputy Superintendent for the alloms were appointed. Later on the Salt Administration in Travancore was merged in the Excise department with Excise Commissioner as the Head of Salt Administration and all the salt factories were placed under an Assistant Excise Commissioner, Nagercoil. The subordinate establishment consisted of five Inspectors, 6 Sub-Inspectors, 44 Preventive Officers, 1 Attender and 157 Guards.

The work of the officers *i.e.* Inspectors and Sub-Inspectors was confined to manufacture, storage and issue of salt. Preventive officers were entrusted with the clerical work and aiding the officers in the manufacture and storing of salt. The protection of the pans, platforms and buildings formed the principal work of the Guards.

The Salt Administration in Travancore-Cochin was taken over by the Central Government from 1-4-1950 and all salt factories (inclusive of lands, buildings and other assets) were taken over by the Central Salt Department. A new Circle was created from 1-4-1950 with Headquarters at Nagercoil, and was placed under a Superintendent, who is under the Assistant Commissioner, Tuticorin. All the old permanent staff of the salt factories was taken over by the Centre.

The Central Government took over the responsibility of manufacture, supply and distribution of salt and gave an undertaking to the State Government that they would not interfere with the arrangements the State Government had made with the licensees as regards payment of rent and royalty in cash or in kind. The Central Excise and Salt Act, 1944 and the Salt Rules were made applicable to part 'B' States and fresh licences were issued to the manufacturers. The ban on import of salt into Travancore-Cochin from other States, which then existed was removed and free trade was allowed from all parts of India subject to the Zonal Scheme restrictions. The State rules relating to manufacture, storage and sale of salt were relaxed and were brought at par with the factories in Madras and Andhra. Salt was an article of Government monopoly in the State and was being sold at high rates fixed by the Government and this policy was totally changed as soon as the Centre took over.

The State Government had not extended the concession of free manufacture of salt under 10 acres concession, but the Government order of 1948 regarding the production of salt by small scale manufacturer in areas up to 10 acres was extended to the State from 1-4-1950.

CHAPTER XIV

CLOSED SALT WORKS

I.—PUNJAB

(a) *Sultanpur Salt Works.*—The Sultanpur Salt Works are situated in the Gurgaon and Rohtak districts of the Punjab. After the Mutiny in 1857, when the British Government annexed the lands of Jhajjar and Farrukhnagar, the salt works which belonged to the Nawab came under their control. The Sultanpur Mehal was formed by combining these with some adjoining villages that had previously lapsed to the British Government on the death of Begam Samru. For many years this was one of the principal sources which supplied salt to the North Western Provinces. The works were adjacent to the grand Preventive Line.

There were altogether 10 manufactories in the Mehal of Sultanpur; 3 in Gurgaon and 7 in Rohtak district. The works were leased out and the monopoly of manufacture was given to the contractors. The party who leased the monopoly were bound under a penal bond called '*Muchalka*' to maintain and supply a sufficient number of *chowkidars* to prevent theft of salt.

The works were under the jurisdiction of the Inland Customs Department and were supervised by a special establishment which consisted of Assistant Patrols, Moharrirs, Kotgashts and peons and was under an European officer. This establishment was first posted in 1859 by withdrawing men from some posts on the grand Customs Line. Their duty was to watch the factories, examine the pits and beds of salt and to see that the *chowkidars* did their duty.

About 1869-70 the works were divided into two groups. The most important of these consisted of 10 great clusters collectively known as the Sultanpur Mehal and the other as Nuh Works. These were above and out of the Inland Customs Line. Government supervision about this time was confined to settling disputes between manufacturers and traders. Government also levied a small cess which represented the share of the native administrations to whose rights it had succeeded. The salt paid duty on crossing the line. The cess varied from works to works from Re. 0/0/6 to 0/1/9 per maund. It represented the share of the State in the produce of the soil, was analogous to land revenue and was paid to the Punjab Government. With the British occupation, the produce of the works gradually increased. The salt belonged to the manufacturers, who arranged its sale direct. Government was only concerned with excise duty and cess. The works were at Mubarakpur, Busserpur, Sadrana, Balpur, Saidpur, Mahamudpur, Sylana and Kalliawas. The output varied from 5 to 6 lakh maunds per annum. It gradually fell after 1885.

It was considered that the cess pressed hard on the industry; it was accordingly reduced to 3 pies per maund from January 1896. This too failed to revive the works. The causes that contributed to their decline are discussed later. The output kept on falling till about 1922-23 when it was only 30,000 maunds and the works were closed.

In 1931-32 a licence for the manufacture of salt was granted to a firm of two respectable refiners, who started reconstructing old pans in February

1932. The manufacture of salt went on till August 1934 when orders for the closure of the works were issued, as they did not prove a success. The works were finally closed from 22nd April 1935.

(b) *Nuh Salt Works*.—Besides the Sultanpur group, the other group was called the Nuh Mehals. As at Sultanpur, numerous clusters of works situated in different villages were included in this group and the produce of different clusters varied greatly in quality, appearance and market value. Here the salt was manufactured in deep vats, where the brine took several months to evaporate and not in shallow pans as at Sultanpur. The salt was of bad quality and was called Salumbha. In the beginning the salt was bitter. It became saleable only when after having been pitted for a long period certain foreign constituents were eliminated by some obscure chemical process in Nature's underground laboratory.

The works were situated about 40 miles from Mathura Railway station. From there the salt reached Hathras which was its chief mart and distributing centre. Traders adulterated Sambhar salt with this or foisted it on the market as Sambhar salt. The output and sales from 1867-68 to 1880-81 varied from one to two lakhs of maunds per annum. This salt lost its market down country owing to large importations of Kokan which was superior and cheaper. Its sales were also affected by works in Oudh. Moreover, the Nuh works were not on the railway; so the output gradually fell. About 1880-81 the output began to fall steadily and the works were in a moribund state. In 1883-84 the stock of salt, over 5 lakh maunds, was purchased from the manufacturers at 1 1/2 annas a maund, but of this quantity 18,971 maunds only were disposed of by public auction and the rest had to be destroyed as unsaleable. The licence to manufacture salt was withdrawn and the works were finally closed.

(i) *Manufacture*.—The works consisted of natural springs very strongly saturated with salt. The brine was got from wells with the help of bullocks. Salt was obtained by solar evaporation in large masonry evaporation pans. The salt produced was of fair quality. The manufacturers were given licences. The works were supervised and the factories guarded to ensure that no salt was made without a licence. The permission of the officer in charge of a cluster of works had to be obtained to extract and store salt. It was not given, unless the salt was of saleable quality.

The salt was extracted and stored under supervision of petty officers. It was estimated in baskets of known capacity and stacked in heaps. The heaps could only be opened in the presence of the officer in charge. Pits were also dug for storage in the vicinity of the pans of the salt factory. The pits were rectangular and of measured dimensions. The salt stored in the pits was covered with a layer of earth.

The old salt works were closed in 1922-23 and the old salt pans, etc., had practically disappeared when licence was granted to reopen the works in 1932. The pans had to be constructed afresh. The brine was derived from wells and evaporated by solar heat in shallow masonry pans varying in size from 200' × 120' to 80' × 40' and from 6" to 12" in depth. Each well had a set of pans about ten in number, the levels of which were arranged to allow the natural flow of brine from the first to the last. The first pan nearest to the well was filled with brine which was allowed to stand for a few days depending on the season and weather. The brine was then run off to the second, then to the third and so on till it reached the

last pan but one—the condenser. When salt began to form there, the brine was at once run off to the last pan—the crystallizer, for a crop of salt. In winter, the evaporation being slow, the process took about 6 weeks from the date the brine was drawn, but in summer 8 to 10 days sufficed. The Sultanpur salt was white, opaque, small in grain and contained sodium sulphate and magnesium chloride as impurities.

(ii) *Output and Issues*.—The following table gives the output and issues of the works for some typical years:—

Year.	Output in maunds.	Sales in maunds.
1867-68	5,76,908	7,20,934
1869-70	6,65,509	6,14,039
1870-71	7,16,697	6,79,409
1875-76	6,38,844	6,19,645
1880-81	5,68,205	5,81,097
1884-85	4,61,834	5,52,404
1889-90	2,66,980	3,29,641
1890-91	1,90,485	2,36,858
1895-96	1,19,392	1,08,133
1899-1900	89,571	78,180
1904-05	78,670	78,819
1909-10	26,945	30,316
1915-16	39,517	37,854
1920-21	42,129	55,999
1923-24	Works closed.	
1932-33 (works re-opened)	23,208	20,568
1933-34	8,010	7,871
1934-35	6,003	7,290 works closed.

The above are tell-tale figures. In 1869-70 there were 240 wells and 3,850 pans and the output was over 6 lakh maunds. About 1880-81 the Sultanpur salt began to feel the competition of cheaper Sambhar salt and the works gradually declined.

(iii) *Causes of decline*.—1. The produce was inferior to that of Sambhar; it was somewhat bitter in taste owing to the presence of impurities.

2. The manufacturers were heavily in debt; the initial density of brine was low (3° Be); salt was manufactured in shallow masonry pans which were expensive to construct and repair. The result was that the cost of production was very high. Before the Rajputana and Punjab sources were opened by Railway, this salt produced close to the populous districts

of the North-Western Provinces and the Punjab had a great sale. The Sambhar lake was, however, connected by the Rajputana-Malwa Railway with Agra and Delhi in 1875 and in 1876 the Through Traffic system was introduced there. So Sultanpur salt could not maintain its hold on the markets hitherto fed by it, which were captured by Sambhar and Khewra salts.

3. Even when an opportunity offered itself due to shortage of Sambhar salt or its higher price, the Sultanpur manufacturers did not take advantage of it. They raised the price and so gradually the market slipped out of their hands. The manufacture was too expensive to be remunerative at low prices. The result was that the output which at one time even reached about 8 lakh maunds gradually declined. These works had the advantage of being on the railway and were nearer to the Oudh markets by 170 miles than Sambhar. Even then the salt could not stand in competition as it was too expensive to make; only one group of factories remained struggling till 1923-24 when the works were closed. They were re-opened in 1931-32. The output during 1932-33 was 23,208 maunds, but it fell to 8,010 maunds in 1933-34. The Department gave special concessions and all possible help to the licensees, but the works proved a failure and so the licence was cancelled and the works closed in April 1935. This salt could not compete with cheaper and better quality Sambhar salt.

(iv) *Distribution, Prices, etc.*—The Sultanpur salt works were at zenith from about 1865 to 1885. The salt was consumed (1) in the adjoining districts of the Punjab, (2) in Rohilkhand and Kumaon districts and in hilly places near Kumaon, (3) in Dehra Dun district, (4) in Oudh, Partabgarh, Pilibhit, Fyzabad districts. The market north of Delhi was gradually lost. The salt during 1932-33, 1933-34 and 1934-35 was sent to Saharanpur, Muzaffarnagar, Delhi, Sonapat and Rohtak, etc., or was consumed in areas around the works. The selling price during 1933-34 varied from Re. 0/3/6 to 0/7/0 a maund and the average price realised was Re. 0/5/6 per maund. The salt sold at Rs. 2/4/0 per maund in the Delhi and Muzaffarnagar markets.

(v) *History of Administration.*—The establishment first posted to the works in 1859 after they came under Government control in 1858 consisted of an European Superintendent and his staff of Assistant Patrols, Moharrirs, Kotgasht and peons. The work of the staff in those days was mostly preventive; they had very little to do with manufacture. About 1879 the Sultanpur and Nuh works were brought under closer supervision and duty on salt manufactured was levied before the salt was cleared. The establishment remained more or less the same. There was a separate Inspector at Zahidpur works. In 1900, the strength was one Superintendent, 2 Inspectors, one Vernacular clerk, 6 Jamadars and 46 Peons. This continued with minor changes till the works were closed in 1923-24. On re-opening of the works in 1931-32, a Deputy Superintendent was put in charge. He had a Jamadar and 6 peons to assist him. He worked under the Assistant Commissioner of the Internal Branch, Northern India Salt Revenue Department. After the closure of the works the establishment was withdrawn, but to prevent illicit manufacture a Jamadar and one peon were allowed to remain there.

(vi) *Recent attempts to revive these works.*—The Punjab Government have been trying to have these salt works restarted and they conducted experiments with this end in view. In fact manufacture of salt was started by M/s. Lakshmi Salt Trading Company under the ten acre concession and they produced about 4,000 maunds of salt annually but abandoned the same. The Punjab Government invited the Salt Department to inspect the site

and give advice in regard to salt manufacture in this area in 1952 and then again in 1955. A Deputy Salt Commissioner was deputed on these occasions who pointed out the many difficulties in regard to labour, cost of production lack of transport facilities and the uneconomic production. The Punjab Government are now thinking of establishing an experimental station there and they had sunk some bore-holes there under the guidance of the Geological Survey of India and the clay obtained during different stages had been sent to the Geologist for analysis.

II.—RAJASTHAN

The soil throughout Rajasthan is impregnated with salt so much so that it is rare to see a low spot without salt efflorescence on the surface. Salt works existed in most of the States. Agreements or treaties were negotiated with the Native States. The more important sources were leased by the British Government, others were closed. Important ones are given below which were also closed sooner or later:—

A.—BHARATPUR

(i) *Historical.*—Bharatpur had big salt works and salt was produced there from times immemorial. Due to the rapid development of the Sambhar Lake Source and the absence of transport and other facilities the manufacture proved to be uneconomical and was abandoned by the Ruler in 1876-77. The British Government, however, took over the area from the Maharaja in 1879 and paid compensation to him (Rs.1,50,000 per annum as royalty and 1,000 maunds of Sambhar salt free of cost and duty). Formerly the salt produced in this area was successfully competing, both in quality and price, with the Sambhar salt in the consuming markets in the United Provinces (now Uttar Pradesh) and the neighbouring Indian States. The average production here at that time was about 12 lakh maunds against an annual production of 9 to 10 lakh maunds at Sambhar Lake during that period. Just before the suspension of manufacture about 11·73 lakh maunds of salt were exported from Bharatpur State. This was in addition to the quantity consumed locally. It is thus clear that in olden days the salt manufacture in the State was a substantial source of State's revenue. The main producing areas in the State were Bharatpur, Dig and Kumher Tahsils. These towns have lost their importance since the suspension of the salt manufacture there.

(ii) *Climatic conditions and potentialities of the source.*—The climatic conditions are similar to that of Sambhar Lake and average annual rainfall is 26". Salt manufacturing season commenced in October and lasted up to June, though the manufacturers who were given licenses in 1949 by the Rajasthan Government, carried on the manufacturing operations for four months only (March to June). The existing wells in the Bharatpur area alone are capable of supplying enough brine if it is drawn by electric pumps and supplied to the beds, which are within a radius of 5—10 miles, by laying pipe-line, the production can be much higher than 12 lakh maunds produced in olden days. The geo-physical survey has indicated abundant supply of subsoil brine.

(iii) *Steps taken by the Rajasthan Government to revive the Salt Industry.*—Seven parties were granted leases for the manufacture of salt and in order to encourage the manufacturers, subsidy for the construction of beds was given by the State Government in addition to the following facilities:—

- (1) Controlled articles, like cement, pipes, etc., were supplied at controlled rates.
- (2) Free technical advice.
- (3) Engine pumps.
- (4) Custom charges were waived in case of imported goods.
- (5) Lands were leased without any assignment fee.

The State Government spent a large sum, but in the absence of proper technical guidance and the unwillingness of the lessees to follow properly the instructions given, the money has gone a waste and has not produced results commensurate with the amount spent. The main causes of the poor results were—

- (1) Only two experimental pans were opened at Bhajnaki Garhi whereas at least 20 should have been opened.
- (2) Salt was dried by centrifugal which is costly and the capacity was limited.
- (3) Wind mill was installed which did not work properly due to less wind velocity.
- (4) Full season (October to June) was not availed of.
- (5) The pans, wells, etc. were not constructed according to basic principles.
- (6) The engine power was not fully utilised and it resulted in waste of power.

B.—PHALODI

This salt source is a depression about 5 miles by 3 miles and salt used to be manufactured here under the same system as at Didwana. The Phalodi town is situated between Jaisalmer and Bikaner, but on the N.W. Frontier of Jodhpur and at a distance of about 70 miles from Jodhpur town. The source was leased by the British Government in 1878 from the Jodhpur Darbar. The production and sale of salt ranged from 15,000 to 50,000 maunds per annum. The salt was distributed to Jodhpur, Bikaner, Bahawalpur and Jaisalmer. The source was so inaccessible that the produce could not be economically placed on the market and as the business of Sambhar and Pachbadra increased under the stimulus of railway communication, sales at this source gradually fell off. Bikaner Darbar drew considerable supplies from the place. As soon as the Jodhpur-Bikaner Railway was opened, placing Sambhar and Pachbadra in direct railway communication with Bikaner, the source was closed in 1897. Compensation was paid to the manufacturers.

The Government have again leased certain lands in this area to private salt manufacturers and they are producing salt in this area. To supervise the manufacture of salt and to ensure realisation of Government cess on the produce, an Inspector has been posted there. The area under production is 600 acres and the production has been about 2 lakh maunds. It is, however, doubtful if this salt will find a ready market owing to the location of the works at a distance of about 12 miles from the nearest railway station and the consequent transport by road upto the rail-head

C.—LUNI SALT TRACT

The river Luni takes its rise in the hills west of Ajmer and flowing near Jodhpur and under Pachbadra, Balara, Boyatra and Bakasir falls into the Rann of Kutch at the point of junction between the three Frontiers of Sind (Pakistan), Rajasthan and Gujerat. At the mouth of the Luni river where it enters the Rann of Kutch, a large delta has been formed by the annual floods with numerous deep channels. During the dry months of the year, when the bed of the main stream is perfectly dry, brine percolates into these channels and salt of good quality forms in thousands upon thousands of tons annually. It is swept away when the river comes down in floods in the monsoon. Salt also forms in a sheet over the end of the Rann itself when the wind causes an accumulation of brine at its head. The country around is desolate.

The nearest railway station is about 100 miles distant. This existence of vast deposits of natural salt was fraught with danger to salt revenue, so the Luni Salt Tract was leased by the British Government from the Maharaja of Jodhpur in 1878. Under the lease Government got control over the entire course and estuary of the river Luni from near Balotra to the Rann of Kutch. It was not found profitable to sell the salt. A Preventive Establishment was stationed to guard the salt, and the system of free distribution of salt to the local inhabitants was introduced. This system went on till July, 1947. About four to five thousand maunds were annually distributed at the rate of 6 seers per head per annum. The tract was closed in 1887-88 so far as collection and sale of salt were concerned. An Inspector was stationed at Bhatki for 6 months each year. He and his staff prevented the removal of salt from the numerous and extensive deposits in the Luni river and the channels of its delta. This staff continued to be posted till July 1947 and was discontinued in 1947 as the duty on salt was abolished.

D.—KACHOR REWASSA

This source in the Jaipur State was leased by the Maharaja to the British Government in 1878. The salt forms in a shallow depression. The local manufacturers, however, refused to sell salt to the British Government and as the Department was not prepared to agree to the source being worked without direct control over the sales, the manufacturers abandoned their factories for agriculture and the source has remained closed ever since. The source was at a distance from the railway and could not have been profitably worked in competition with the adjacent sources of Sambhar and Didwana.

E.—BIKANER

Bikaner has the source of Lonkaran Sarr situated at a distance of about 50 miles from Bikaner. This is a depression about 2 miles long and 1 1/2 miles broad and brine springs are found below this. Pits were dug in the depression and brine was used to manufacture salt by solar evaporation.

F.—JAISALMER

Jaisalmer has a salt source at a place called 'Kanod'. Salt was manufactured from brine obtained from pits sunk to a depth of about 10 feet. The production in the past was about 6,000 maunds per annum. The local kharwals have also now abandoned the manufacture and the salt beds

are lying in a damaged condition. The Rajasthan Government have, however, represented that this source should be revived so that it may cater to the needs of the local population as Kanod being in the interior, transport of salt from Pachbadra etc. is very difficult and too expensive.

The manufacture of salt in the Native States of Rajputana and Central India, except at the sources leased to the British Government, and export from the States authorised to receive salt from the sources leased by the British Government free of duty or free of price and duty, were prohibited by the salt agreements entered into between the Darbars and the British Government. Some States such as Gwalior, Datia, and Jaisalmer were, however, permitted to manufacture certain fixed quantities of salt for their local consumption, but export of such salt outside the State concerned was prohibited. Officers were periodically deputed by the Department to these States to watch the proper observance of the agreements and to advise them on manufacturing process but the States did not avail themselves of this assistance.

III.—HYDERABAD STATES

Salt for domestic use as well as for tanning industry was manufactured from times immemorial in several places in the Hyderabad State more particularly in the Raichur district in the greater part of the doab between the river Kistna and Tungabhadra, a larger portion of the Mulkair Circar and in the northern division of Shorapur. In these districts there are saliferous tracts, from which salt was made from brine or saline earth by salt makers called 'Uppars' in their 'Nimak Moles' salt work units. A tract 25 miles east of Shorapur has several brine wells from which also brine was drawn for salt manufacture. The area, considered best suited for salt manufacture, is around Sarjapur, Beychbal and the banks of the Don river.

Natural brine was obtained from springs 10' to 25' below the surface of the lands near *nallas* or water courses. The presence of saline matter in the rocks and soils can perhaps be accounted for to a great extent by the accumulation of saline matter due to disintegration and decomposition of the original rock formation brought about by ordinary natural conditions. Whatever be the source of the brine, the presence of minerals, usually occurring in sea water, is very marked. There is a copious supply of brine at various places in the district which leads to the supposition that there are deep-seated deposits similar to those found in America. The brines vary from 0.5° to 2.5° Be., on an average 1° Be. To raise the density of weak brine saline efflorescence found in the surrounding *nallas* were added. The higher density brines thus prepared were then charged into shallow basins and allowed to evaporate. Lixiviation of saline earth was very elaborately carried out in all these places. The crystallising pans were 20' × 40' with 9" side walls. The pans were filled to a depth of 2" by brine prepared by leaching up to 8° Be. The salt obtained was good white crystals, but if methods of preparation were not properly followed a second quality salt was obtained and this was used in tanning.

The chief centres of manufacture were:—

(1) Sarjapur-Guddinhal Centre—Gurgunta Samasthan in Lingusugur taluka; (2) Beychbal-Teghihalli-Kudligi centre in Surapur taluka in Gulbarga district; and (3) Chikhal centre in Surapur taluka. In addition, salt was also manufactured in scattered villages in small quantities.

There were no permanent salt works in any particular area as the site of salt works shifted from place to place and from time to time, the total number increasing or decreasing, according to local conditions and salt works, which were active at one time were abandoned, or some of the abandoned salt works were revived according to the natural resources and facilities available for the 'UPPAR'. The actual average production per annum was about 50,000 maunds of edible and 18,000 maunds of tannery salt.

CHAPTER XV

FOREIGN SALTS IN INDIA

A. Historical.—Local manufacture of salt went on in Bengal along the sea coast long before the British appeared on the scene. The East India Company developed a system of monopoly, which survived with modifications till 1862. Up to 1816 the import of foreign salt was prohibited. Foreign salt was first imported into Bengal in the year 1818-19. No large importations, however, occurred until the year 1835-36. Even in 1835-36 only 2,84,858 maunds were imported. There were big obstacles in the way of foreign salt in the shape of high import duty and penal bonding regulations, which evoked a powerful agitation from manufacturers, ship-owners and trade magnates of England who tried to persuade the Court of Directors to abolish the the East India Company's monopoly. Customs duties were at the outset levied on imported salt at rates fixed with reference to the average prices realised at the auction sales of salt made at Government agencies, but the fixed rate of duty introduced under the orders of 1837 was applied to imported as well as to the locally manufactured salt. The repeal of salt duties in England about 1825 gave a great impetus to the salt industry there, and Liverpool salt began to be imported into Bengal in large quantities. As shown in the Chapter on Bengal, the indigenous industry could not stand competition with cheaper and better quality foreign salt and gradually died out. Government abandoned monopoly in 1863, leaving manufacture subject to Excise duty only until 1898 when the local manufacture was prohibited altogether. Since 1863 foreign salt had been the mainstay of Bengal. In 1851-52 the quantity of imported salt amounted to 31,74,370 maunds. Imports gradually increased. In 1861-62 they were 61,28,726 maunds, in 1889-90, 1,00,70,962 maunds and in 1911-12 about 1,34,86,000 maunds. Imports into Bengal up to 1950 were about 160-165 lakh maunds. Imports continue at this level but they are now from Indian sources only (Saurashtra), and foreign salt has been cut out altogether.

B. Countries of Origin.—Before the passing of the Additional Import Duty Act in 1931, salt was imported from England, Germnay (Hamburg and Bremen), Aden, Egypt (Port Said), Spain (Torrevieja on the coast of Valencia), Italian East Africa (Massowah, Assab) in the Red Sea and Roumania. Bengal and Burma divided the whole supply. Indian sources such as Karachi (now in Pakistan), Bombay, Madras and States in Kathiawar also sent salt to Bengal and Burma. Imports of foreign salt into other provinces were negligible. About 1935 in Bengal salt was imported only from Germany (Hamburg), Aden and Indian sources. Imports from other sources, namely England, Spain, Port Said and the Red Sea ports (Massowah and Assab) had practically stopped. Since the development of big salt works in Saurashtra, imports from foreign countries or Aden have ceased altogether and all salt supplied to Calcutta is of Indian origin.

C. Different Varieties.—Liverpool salt termed 'Panga' salt in India was obtained by boiling brine pumped from mines. It was pure white in colour and had fine crystals. It used to fetch the highest price; Rs. 8 or Rs. 10 per 100 maunds more than solar salt and was very popular in Bengal and Assam. Dryness, whiteness and evenness of grain were its chief characteristics and it was taken as standard in Bengal. What remained of the market for this quality of salt was captured by Germany, but Germany

too lost the Indian market as Saurashtra works were developed and they began to cater to the Calcutta market.

German Salt was rock salt obtained from mines and was imported crushed. Its chief characteristic was its dryness and immunity from wastage due to climatic conditions.

Spanish Salt was white salt of good appearance, was obtained by solar evaporation of sea brine, had a larger percentage of sodium chloride than any other imported solar salt and was drier than Liverpool or Aden salt. It came either uncrushed (*Karkutch*) or fine crushed by being passed through rollers. It was first imported in 1904 and steadily gained ground.

Mossowah salt was also a product of solar evaporation. It came first in 1909-10. It was whiter and finer than Port Said and Aden salt. It was imported only in crushed form.

Port Said salt was obtained by solar evaporation and imported both in the natural state and crushed form. In the beginning, about 1905, it was unpopular owing to its moisture, poor quality and reddish tinge. Its quality gradually improved. Being cheaper than the English, German or Spanish product, its imports greatly increased until the time of the imposition of the Additional Import duty.

Aden salt was manufactured from sea water by solar evaporation and imported either in *Karkutch* or fine form; it headed the list of salts imported into Bengal in 1914-15 and in 1917-18 was second on the list both in Bengal and Burma. It was very popular on account of its cheapness. It was available in many qualities such as Aden Fine, Aden Solar Fine, Little Aden Fine, Indo-Aden superfine. From 1933 its imports enormously increased, and it headed the list of imported salts in Bengal.

Djibouti Salt was manufactured from sea water and was crushed. It used to be whiter than Aden.

Ras Hafun salt.—Big salt works exist at Ras Hafun on the coast of Italian Somaliland. Ras Hafun fine salt was a high quality Red Sea Salt.

Assab salt was a Red Sea salt of slightly inferior quality.

Rumania salt was crushed rock salt from Roumania Mines.

Formerly salt was also imported from Salif in Kamaran Island off the Yemen coast of the Red Sea. Salt also used to come in both *Karkutch* and fine form from Rawaya on the Egyptian coast of the Red Sea. Salt was also imported from Persian Gulf (Muscat, Hanjam and Linga).

D. System of Imports.—Salt was imported all the year round. Liners from Liverpool and Hamburg brought salt as keel ballast. From Spain and Port Said salt was brought in complete ship loads. Importations from all sources were heavy previous to jute export season as tramp steamers brought full cargo loads of salt and carried away jute. Salt from Aden was imported chiefly by tramp steamers which brought coal from Europe to Port Said and then salt to India from Aden.

Supplies and imports of foreign salt varied according to shipping facilities, which in turn depended on external political conditions and to some extent on India's exports of jute and tea. Bengal, however, depended solely on imported salt. Bihar, though consuming about 40 lakh maunds, did not show such determined preference for it as Bengal.

E. Import Figures.—Imports of salt into Bengal and Burma up to the year 1950-51 are shown below. They are shown in lakhs of maunds:—

Year	Bengal	Burma
1911-12	134·86	16·91
1912-13	137·03	17·07
1913-14	146·70	19·27
1914-15	108·29	17·35
1915-16	134·24	16·32
1916-17	95·27	11·47
1917-18	83·79	12·39
1918-19	100·96	11·11
1919-20	108·38	10·16
1920-21	156·06	12·23
1921-22	116·50	15·48
1922-23	132·59	16·79
1923-24	103·16	18·81
1924-25	151·73	21·75
1925-26	136·92	22·17
1926-27	132·20	21·65
1927-28	145·24	24·63
1928-29	150·37	23·37
1929-30	162·46	25·89
1930-31	172·24	24·51
1931-32	135·09	13·51
1932-33	156·25	22·43
1933-34	123·28	10·76
1934-35	140·06	15·63
1935-36	153·58	.. (63·09)
1936-37	144·07	.. (62·85)
1937-38	144·3	.. (62·34)
1938-39	131·1	.. (58·00)
1939-40	157·3	.. (80·00)
1940-41	118·5	.. (56·54)
1941-42	109·6	.. (71·34)
1942-43	68·0	.. (35·91)

Burma figures against these years are for the calendar years from 1912 to 1919.

Year	Bengal		
1943-44	65.1	..	(45.37)
1944-45	117.0	..	(73.98)
1945-46	90.7	..	(58.59)
1946-47	151.9	..	(25.24)
1947-48	138.9	..	(98.00)
1948-49	146.6	..	(73.25)
1949-50	165.5	..	(62.86)
1950-51	156.9	..	(37.35)

(1) The figures in bracket show the imports into Bengal from Indian Sources.

(2) There were no imports of foreign salts after 1950, as India became self-sufficient and Saurashtra ports not only began to feed the Bengal from their produce, but also started exports to Japan.

Imports by countries of origin from 1931-32 to 1950-51 are given below :—

Name of the Port or Country	(In Maunds)			
	1931-32	1932-33	1933-34	1934-35
Liverpool	5,38,655	6,45,068	19	16
Hamburg	3,10,010	7,56,696	10,50,263	9,35,360
Spain . . . . .	..	5,64,165	..	..
Port Said	3,54,606	5,63,251	74,211	53,842
Aden	83,22,781	79,11,327	76,83,657	72,51,657
Bombay	9,19,132	3,56,232	4,28,529	4,32,023
Karachi	7,56,571	9,44,860	8,50,194	21,13,058
Okha	3,54,462	9,19,296	10,38,586	15,78,300
Djibouti . . . . .	..	1,41,300	..	..
Assab	5,03,243	10,23,340	..	..
Tuticorin	4,53,099	4,02,128	2,97,799	4,17,932
Rass Hafun	8,01,214	11,07,401	2,00,620	1,12,022
Navalakhi	1,95,345	1,92,520	3,58,150	4,92,081
Nadir (Porbandar) . . . . .	..	97,460	3,46,320	6,19,570
Madagascar . . . . .	..	..	272	..

(In Maunds.)

<i>Burma.</i>							
United Kingdom	.	.	.	1,43,937	17,892	4,063	5,384
Aden	.	.	.	11	..	1,94,544	3,81,593
Germany	.	.	.	3,81,351	8,53,009	4,78,549	7,11,831
Spain	.	.	.	97,843	1,93,127	62,187	..
Port Said	.	.	.	2,35,589	5,25,355	2,35,599	3,03,470
Italian East Africa	.	.	.	4,76,536	6,46,452	95,278	1,54,787
Indian Ports	.	.	.	15,185	6,615	5,282	2,719
Other Countries	.	.	.	141	182	121	3,687

Name of the Port or Country	1935-36	1936-37	1937-38	1938-39
Liverpool	15	51,736	22	1,69,710
Humburg	10,71,260	11,36,357	11,16,480	7,90,548
Port Said	1,56,944	..	..	21,12,480
Ras Hafun	..	..	..	4,52,640
Aden	78,21,093	69,34,103	83,78,440	45,24,829
Karachi	26,18,780	32,15,435	26,70,754	19,21,040
Djibouti	..	..	..	5,61,630
Bombay	8,38,517	3,77,812	5,75,965	4,81,104
Okha	11,59,960	11,88,890	12,39,960	12,79,560
Navalakhi	4,75,730	6,65,356	8,32,478	1,15,920
Nadir	9,70,840	8,12,690	8,33,030	10,64,740
Jamnagar	..	..	..	4,96,900
Kutch	..	..	..	1,89,520
Tuticorin	2,44,792	24,660	81,872	..

(In Maunds)

Name of the Port or Country	1939-40	1940-41	1941-42	1942-43
Liverpool	2,34,875	..	..	..
Hamburg	3,23,107	..	..	..
Ras Hafun	10,47,800	..	..	..
Port Said	6,42,438	..	..	..
Aden	57,36,082	39,58,361	33,28,749	15,55,166
Karachi (Sind)	20,83,288	20,08,733	13,63,659	2,75,902
United Kingdom . . . . .	..	1,29,080	2,722	708
Canada . . . . .	..	54	..	..
C.W. Australia . . . . .	..	191	272	..
Italian East Africa . . . . .	..	6,09,798	..	1,44,593
Egypt . . . . .	..	7,35,762	32,82,552	17,62,889
Anglo Egyptian Sudan . . . . .	..	1,97,578	2,61,415	1,56,517
U. S. A. . . . .	..	27	27	..
Ceylon . . . . .	..	..	109	..
Spain . . . . .	..	..	2,31,964	..
Bombay	5,40,025	7,06,851	2,09,556	..
Okha	14,34,364	34,22,055	19,09,774	14,54,950
Navalakhhi	8,47,218	3,89,811	3,46,309	2,39,750
Nadir	14,88,258	..	..	..
Jamnagar	6,55,732	81,845	6,14,262	..
Kutch	8,02,355	5,82,652	3,98,794	4,99,773
Porbandar . . . . .	..	3,13,474	1,43,940	..
Tuticorin	1,43,136	..	..	..
Madras other Ports . . . . .	..	6,09,244	64,254	6,92,886
Madras Central Port . . . . .	..	..	..	25,698

(In Maunds)

Name of the Port or Country	1943-44	1944-45	1945-46	1946-47
Aden	17,69,563	18,61,172	7,52,313	10,99,417
Egypt	22,90,711	47,27,476	51,45,381	10,31,019
I.E. Africa	2,12,278	3,52,815	..	..
French Somaliland	2,50,444	2,74,868	..	..
A.E. Sudan . . . . .	..	2,47,668	..	3,82,461
C. W. Australia . . . . .	..	191	..	27
U.S.A. . . . .	..	27	27	..
Karachi (Sind) . . . . .	..	4,99,800	5,34,867	19,44,324
United Kingdom . . . . .	..	..	..	2,096
Okha	10,48,038	3,67,466	5,76,119	32,90,474
Navalakhi	1,63,300	9,20,159	5,69,472	4,12,792
Kutch	4,63,272	9,67,754	7,74,368	9,22,201
Jamnagar	3,17,748	5,15,289	5,03,911	..
Bhavnagar . . . . .	..	8,66,013	5,71,296	5,21,011
Porbandar . . . . .	..	..	2,00,164	10,73,278
Jafarabad . . . . .	..	..	..	52,24,336
Bedibunder . . . . .	..	..	..	7,84,332
Madras Central Port . . . . .	..	1,11,413	7,758	..
Madras other Ports . . . . .	..	2,804	1,23,255	3,37,026

Name of the Port or Country	1947-48	1948-49	1949-50	1950-51
Aden	35,92,043	54,91,989	40,62,933	28,73,898
Egypt	28,58,872	6,80,500	14,22,033	8,49,027
I. E. Africa	8,68,300	5,72,662	..	..
French Somaliland	2,57,250	1,03,813	..	..
A. E. Sudan	2,55,290	..	..	..
C. W. Australia	54	..	..	..
Karachi (Sind)	18,63,268	..	..	..
Pakistan (Western) . . . . .	..	2,11,216	..	490
United Kingdom	2,994	30,096	27	..
Spain	8,71,100	2,06,833	..	..
B. E. Africa	3,83,768	..	..	..
Italy	2,39,478	..	..	..
Netherland . . . . .	..	..	1,68,772	..
Germany . . . . .	..	..	1,93,222	..
Lebia Tripoli . . . . .	..	..	2,11,107	..
E. Africa . . . . .	..	..	2,12,278	..
Okha	7,28,443	11,28,758	21,19,647	7,12,355
Navalakhi	4,45,028	8,03,692	45,46,889	10,84,330
Kutch	6,66,149	..	16,51,947	15,86,504
Jamnagar . . . . .	..	..	4,30,050	14,75,635
Bhavnagar	2,82,191	8,43,305	15,81,849	18,66,889
Porbandar	5,33,452	8,74,721	14,31,398	16,35,287
Jafarabad . . . . .	..	7,57,104	8,19,322	8,90,155
Bedibunder	6,69,742	8,01,351	4,95,145	10,32,408
Bombay	96,599	..	10,698	..
Kandla . . . . .	..	15,69,784	..	..
Madras other Ports	37,735	1,08,713	..	..
Madras . . . . .	..	..	10,83,732	21,09,793

In Bengal the Liverpool salt had about 75 per cent share of the total imports from 1873 to 1903, Aden about 11 per cent and the rest of the countries about 14 per cent only. Before the first World War England was the biggest supplier and then came Aden, Spain, Port Said, etc. But in the year 1934-35 Liverpool practically lost both the markets, Bengal and Burma. During 1934-35 only 16 maunds of this salt were imported into Bengal. Aden was the biggest supplier and controlled about 50—60 per cent of the Bengal market. About 1935 German salt retained about 6-7 per cent of the market, the rest 35—40 per cent was captured by Indian salts from Karachi (now in Pakistan), Okha, Morvi, Porbandar, Madras and Bombay.

Apart from quality price is the determining factor in the demand for any particular kind of salt. The tendency during the last 40 years has been for the cheaper solar salts to replace the dearer English salt.

F. Prices.—Liverpool salt was the dearest. Before the first World War the rate of this salt was about Rs. 50 per 100 maunds, while the rates of other varieties varied from Rs. 40 to Rs. 45. The price of salt in Calcutta market fluctuated—as it does even now—violently. Freight was an important factor and any variation in freight affected the price of salt. During the War (1914—18) there was an acute shortage of tonnage and so freight rates rose up and imports of salt were at their lowest. Prices in 1917 went up to Rs. 434 per hundred maunds and so in 1918 the Bengal Government fixed a maximum rate ex-golah varying from Rs. 239 to Rs. 248. Another cause of fluctuation in prices was the operation of Combines and speculations on the part of dealers. Three or four times a Combine was formed with the ostensible object of stabilizing prices but in reality to retain market against new importers. The price was also affected by irregular arrival of salt shipments. The following statement shows the average wholesale prices of salt ex-ship per 100 maunds at Calcutta:—

Year	Rupees	Year	Rupees
1911	68	1928	88
1912	66	1929	66
1913	62	1930	48
1914	55	1931	56
1915	110	1932	64
1916	146	1933	40
1917	274	1934	50
1918	187	1935	51
1919	172	1936	54
1920	130	1937	63
1921	113	1938	46
1922	100	1939	52
1923	80		
1924	79		
1925	58		
1926	68		
1927	104		

G. Quality of Foreign Salts.—The quality of foreign salts was very high, as the following analysis figures of salts from various countries show:—

Analysis of Imported Salts

The following statement shows the analysis of various kinds of salt imported into Calcutta :—

Description of Samples	Insoluble		Percentage calculated on moisture-free samples								Total	Moisture in the samples.		
			Organic	Inorg.	Sodium chloride	Magnesium chloride	Magnesium sulphate	Calcium sulphate	Calcium chloride	Sodium sulphate			Undetermined (by diff.)	
	%	%												%
1. Fine White Cheshire.	..	Trace	%	97.76	..	%	1.31	%	0.90	..	%	0.03	100.0	0.23
2. Hamburg Fine	..	0.42	..	98.19	..	..	0.51	0.39	..	..	0.49	100.0	0.19
3. Spanish Fine	..	0.13	..	97.81	..	..	0.88	1.12	..	..	0.06	100.0	0.62
4. Spanish Karkutch	..	0.30	1.20	96.57	0.16	..	1.46	..	..	..	0.31	100.0	3.17
5. Port Said Crushed.	..	0.16	..	98.58	..	..	0.71	0.35	..	..	0.20	100.0	2.06
6. Bombay Karkutch	Traces	0.03	0.78	98.08	0.08	..	0.51	..	..	..	0.52	100.0	7.36
7. Aden Fine	..	0.01	..	98.19	..	..	1.41	0.06	..	..	0.33	100.0	3.81
8. Aden Karkutch	..	0.01	..	98.35	..	..	1.05	0.54	..	..	0.05	100.0	1.61
9. Fine White Mas-sowah Crushed.	..	0.02	..	97.60	..	..	1.63	0.51	..	..	0.24	100.0	4.0

Analysis of various kinds of salt imported into Calcutta—contd.

Description of Samples	Insoluble		Percentage calculated on moisture-free samples							Total	Moisture in the samples
			Sodium chloride	Magnesium chloride	Magnesium sulphate	Calcium sulphate	Calcium chloride	Sodium sulphate	Undetermined (by diff.)		
	Organic	Inorg.									
10. Liverpool Lump Rock.	%	%	93.28	%	%	0.89	0.85	%	0.04	100.0	0.62
11. Djibouti Crushed.	..	4.94	97.82	..	..	1.40	..	0.69	0.08	100.0	3.45
12. Indo Aden Fine	..	0.01	98.11	..	..	1.31	0.29	..	0.11	100.0	3.22
13. Indo Aden Kar-kutch.	..	0.12	98.30	..	..	1.37	0.17	..	0.04	100.0	3.35
14. Hamburg Vaca	..	0.16	98.25	..	..	1.33	..	0.22	0.04	100.0	0.57
15. Fine White Spanish Crushed.	..	0.24	99.03	..	..	0.27	0.37	..	0.09	100.0	0.90
16. Karachi Fine	..	0.08	97.67	..	..	1.62	0.58	..	0.05	100.0	2.95
17. Karachi	..	0.21	97.64	..	..	1	0.63	..	0.25	100.0	2.27
18. Aden Solar Fine	..	0.16	97.15	..	..	1.92	0.71	..	0.06	100.0	4.48
19. Tunis Fine	..	1.0	97.62	..	..	0.86	0.39	..	0.13	100.0	0.91
20. Tunis Crushed	..	0.77	97.81	..	..	0.90	0.38	..	0.14	100.0	0.74

21. Tunis Table	..	0.52	98.32	..	0.62	0.13	..	0.41	100.0	0.36
22. Tunis White Karkutch.	..	0.31	97.94	..	1.24	0.54	..	0.03	100.0	2.96
23. Rumania Fine.	..	0.62	98.95	..	0.18	..	..	0.25	100.0	0.37
24. La Princesse Salt	..	1.01	97.45	..	0.96	0.10	..	0.48	100.0	1.45
25. Little Aden Karkutch.	..	0.33	97.97	..	0.94	0.57	..	0.19	100.0	3.04
26. Hamburg Rock	..	..	99.92	..	Trace	..	..	0.08	100.0	..
27. Okha Salt	..	0.41	96.93	..	1.63	0.78	..	0.25	100.0	3.13
28. Aden Karkutch	..	0.52	98.17	..	0.94	0.99	..	0.28	100.0	1.2
29. Tuticorin	..	0.49	95.70	..	2.08	..	1.52	0.21	100.0	7.76
30. Hamburg Brine	..	Trace	97.70	..	1.22	0.85	..	0.23	100.0	0.48
31. Okha (Uncrushed).	..	0.06	98.33	..	1.12	0.39	0.39	0.10	100.0	3.13
32. Karachi Grax Super Karkutch.	0.04	0.29	97.43	0.48	0.95	0.16	..	0.65	100.0	4.05
33. Karkutch Hamburg.	..	0.20	98.51	0.19	0.83	0.05	Potassium	present.	100.0	0.63
34. Massowah Karkutch.	0.02	0.09	96.42	1.27	1.54	..	Potassium	0.22	100.0	8.71
35. Special Ras Hafun Karkutch.	0.05	0.21	98.67	0.33	0.76	0.02	Potassium	0.44	100.0	2.9
36. Special Ras Hafun Crushed.	0.04	0.01	98.25	0.44	0.73	Nil	Nil	Nil	100.0	6.74
				0.05			Potassium	present.		

Analysis of various kinds of salt imported into Calcutta—contd.

Description of Samples	Insoluble		Percentage calculated on moisture-free samples								Total	Moisture in the samples		
			Organic	Inorg.	Sodium chloride	Magnesium chloride	Magnesium sulphate	Calcium sulphate	Calcium chloride	Sodium sulphate			Undetermined (by diff.)	
	%	%									%			%
37. Java Karkutch .	0.04		0.75		%	96.78	1.11	0.22	0.89	..	Nil. Potassium	0.71 present.	100.0	8.70
38. Karachi Moon Karkutch.	0.06		0.60			93.88	1.66	..	3.15	Traces.	Nil. Potassium	0.65 present.	100.0	9.44
39. Aden Solar Karkutch.	0.08		0.48		0.23	97.51	0.23	0.07	1.23	..	Nil. Potassium	0.40 present.	100.0	9.40
40. Fine White Spnish.	0.01		..		Traces	99.65		..	0.28	..	Nil. Potassium	0.06 present.	100.0	5.94
41. Karachi Grax Coarse Karkutch.	0.17		0.62		0.58	96.45	0.58	..	1.39	0.40	Nil. Potassium	0.39 present.	100.0	3.41
42. Ras Hafun Duedan Karkutch.	0.02		0.11		0.18	98.85	0.18	..	0.79	0.02	Nil. Potassium	0.03 present.	100.0	2.21
43. Ras Hafun Fine	0.02		0.11		0.32	98.54	0.32	..	0.81	0.16	Nil. Potassium	0.04 present.	100.0	2.79
44. Asab Coarse.	0.02		0.07		1.32	96.87	1.32	0.75	0.83	..	Nil. Potassium	0.14 present.	100.0	3.79
45. Karachi Grax Karkutch.	0.04		0.39		0.42	96.81	0.42	..	1.66	0.48	Nil. Potassium	0.20 present.	100.0	1.78

46. Okha Karkutch	0.05	0.48	97.39	0.63	0.11	1.22	..	Nil.	0.12	100.0	3.33
47. Okha Crushed	0.02	0.34	98.01	0.46	0.15	0.96	..	Nil.	0.06	100.0	2.94
48. Ras Hatun Bright	Traces	0.08	98.80	0.33	..	0.76	0.03	Potassium	present.	100.0	1.09
49. Navalakhi	0.01	0.17	96.83	1.32	0.61	0.72	..	Nil.	..	100.0	6.89
50. Karachi Laxmi Vaca No. 2.	0.10	0.62	97.05	0.72	0.20	0.95	..	Potassium	0.34	100.0	5.11
51. Karachi Grax fine.	0.03	0.52	96.49	0.64	..	1.49	..	Potassium	0.36	100.0	4.97
52. Tuticorin Karkutch.	0.06	0.55	93.63	2.47	1.73	1.06	..	Nil.	0.83	100.0	5.85
53. Tuticorin Coarse A.	0.13	0.67	92.98	2.37	1.83	1.53	..	Potassium	present.	100.0	5.82
54. Tuticorin Coarse B.	0.12	1.00	93.10	2.66	1.50	1.20	..	..	0.49	100.0	5.25
55. Karachi Nas. Karkutch.	0.51	0.06	95.56	1.07	0.17	2.10	..	..	0.60	100.0	3.78
56. Karachi Laxmi Fine.	0.64	0.03	96.70	0.51	0.40	1.12	..	..	0.49	100.0	2.46
57. Navalakhi Karkutch.	0.20	..	97.50	0.68	0.51	0.76	..	..	0.57	100.0	4.49
58. Karachi Grax Fine Crushed.	0.31	0.06	97.66	0.50	0.09	0.95	..	..	0.32	100.0	1.93
59. Tuticorin Super Karkutch.	0.30	0.10	93.83	2.92	1.38	1.14	..	..	0.46	100.0	9.66
60. Tuticorin Crushed Karkutch.	0.67	Trace	93.75	2.42	1.58	1.28	..	..	0.37	100.0	5.69
61. Coarse grained Madagasc.	0.12	0.08	98.62	0.27	..	0.51	0.09	..	0.20	100.0	..
									0.39	100.0	..

Analysis of various kinds of salt imported into Calcutta—contd.

Description of Samples	Insoluble		Percentage calculated on moisture-free samples								Total	Moisture in the samples
	Organic	Inorg.	Sodium chloride	Magne- sium chloride	Magne- sium sulphate	Calcium sulphate	Calcium chloride	Sodium sulphate	Under- mined (by diff.)			
			%	%	%	%	%	%	%	%		
62. Navalakhi Black Karkutch.	0.01	0.05	96.77	0.79	0.11	0.97	..	..	..	0.27	100.0	1.77
63. Karachi Uncrushed.	0.34	0.01	96.04	0.87	..	2.00	0.22	..	..	0.48	100.0	1.41
64. Navalakhi Uncrushed.	0.17	0.05	96.66	1.40	0.44	..	0.82	..	..	0.50	100.0	4.43
65. Navalakhi Crushed.	0.16	0.06	97.10	0.95	0.53	0.75	..	..	..	0.46	100.0	3.29
66. Karachi Khursheed Crushed.	0.35	Trace	96.95	0.60	0.07	1.46	..	..	..	0.51	100.0	1.83
67. Karachi Khursheed Karkutch.	0.27	0.01	98.37	0.36	0.19	0.42	..	..	..	0.39	100.0	3.81
68. Karachi Nas Uncrushed.	0.48	0.10	97.58	0.38	0.57	0.76	..	..	..	0.24	100.0	5.10
69. Karachi Khursheed.	0.35	0.13	97.12	0.62	..	1.38	Trace	..	..	0.43	100.0	4.19
70. Karachi Nas Crushed.	0.67	0.10	95.86	0.38	0.10	2.49	..	..	..	0.37	100.0	5.06
71. Karachi Khursheed Fine.	0.33	0.12	98.00	0.38	0.03	0.87	..	..	..	0.27	100.0	2.63
72. Karachi Nas Fine	0.55	0.12	95.79	0.55	..	2.63	..	..	..	0.46	100.0	3.74
73. Tuticorin White Karkutch.	0.74	0.10	95.06	0.83	..	3.05	Trace	..	..	0.20	100.0	5.09
74. Karachi Gulbai Karkutch.	0.10	0.40	96.52	0.40	..	1.92	0.35	..	..	0.31	100.0	1.86

H. *System of Sales and Issues*.—The control of the importation and issue of foreign salt was in the hands of the Collector of Customs working under the control of the Central Board of Revenue. The imported salt passed into consumption by payment of duty direct from shipboard or from the salt golahs at Howrah or Chittagong (now in Pakistan) or from the inland bonded warehouses.

(i) *Bonded in bulk*.—As soon as possible after the arrival of the ship, and on the Agents' application, weighing tubs, scales and fittings were sent on board. The salt was brought from the hold and swung into a 20 maund tub which discharged into a wooden chute slung outside the ship. The chute took the salt into the barge below. When the required quantity had been discharged, the salt in the boat was adulled, that is, stamped all over with a wooden stamp, and a protective boat note was granted. The hatches were then put on and sealed, and the boat was despatched to the salt golahs. On arrival at the golahs an Inspector in charge examined the papers, and if every thing was correct, discharge commenced, salt being carried from the barge in head-loads.

(ii) *Duty-paid in bulk*.—Bills of entry were despatched on board under sealed covers to the Customs Officer in charge. Before delivery of duty paid salt, the merchant, or his licensed representative produced a delivery order granted by the Agents and addressed to the master of the vessel, with a cash receipt. These were compared with the Bill-of-entry and discharge was allowed. The method of delivery for duty-paid salt was the same as for salt discharged for Bond. On completion of each boat, the salt was adulled, a boat note granted and the boat released. A percentage of boats was check-weighed under the supervision of the Salt Inspector of the Golahs.

(iii) *Duty-paid in bags*.—The salt was taken up from the hold stored on deck, and shovelled into 2 maund tubs and weighed. The tubs were then emptied into bags which were sewn and loaded into boats.

(iv) *Deliveries ex-Golahs*.—When a merchant required salt from the golahs he presented his bill of entry and delivery order to the Inspector. The salt was then weighed in 2-maund tubs, the Preventive Officer watching the weighment. As each bag was taken away, the officer handed a *cowrie* to the coolie and also kept a tally on the tally sheet. The *cowries* were dropped by the coolies into a bucket on the railway platform, or on the boat, and provided a useful check on the tally sheet.

Extensive deliveries of salt occurred ex-board ship direct, only about 20—30 per cent coming to Golahs. During 1934-35, 1,09,16,849 maunds were cleared ex-ship and 23,71,951 maunds ex-golah.

(v) *Non-duty paid salt*.—An account of the inland bonded warehouses has already been given. Salt intended for the inland bonded warehouses could be discharged by day or night into boats. The discharge into flats direct was permitted by day only. The boats when laden were despatched to the flat in charge of a Charrundar (man specially appointed by the Customs Department for this work). The salt was transferred on board the flat under the supervision of a Preventive Officer. The hold into which the salt was stored used to be entirely separated from others, having hatch covers capable of being sealed. No other cargo could be stored into those holds. When the whole consignment was completed, the salt was adulled, and the three parts of the Special Salt pass made out. A specimen of the seal placed on the hatches was impressed on each, the number of the adul, with the number of seals on the hatch was entered on the Pass. One part of the Pass was forwarded to the Collector of the District in which the inland bonded warehouse was situated, the second was made over to the *Serang* of the flat, and the third was retained in the Customs Department.

CHAPTER XVI

SALT TREATIES WITH FORMER INDIAN STATES OR FOREIGN POSSESSIONS

I—PRE-INTEGRATION PERIOD

(a) *Northern India.*—As shown in the Chapter on the History of Salt Revenue in India, the essence of the salt revenue administration prevailing from 1820 to 1870 was the levy of duty on salt imported into British territory and the suppression of manufacture of salt within that territory. The great Inland Customs Line existed for this purpose. The main object of the Line was to prevent salt produced in the old Indian States from entering into the British territory unless it had paid a duty of Rs. 3 per maund. A subsidiary object was to tax all sugar exported across the Line at the rate of one rupee per maund for refined and 6 annas per maund for un-refined saccharine produce. A large amount of revenue (nearly Rs. 1,50,00,000) was collected from this. This system of Taxation was unsound, cumbersome and a serious handicap to trade. The great Customs Line was 2,500 miles long and stretched from Torbela on the Indus to Mahanadi in the Sambhalpur district of Orissa and was guarded by an army of 13,000 officers and men at an annual cost of Rs. 16 to 17 lakhs. Unless this large amount of revenue was to be given up, it was necessary either to maintain the Customs Line or resort to some other plan for securing the duty on salt. The plan was to excise or control the production of salt, and the production lay almost entirely in former Indian States. To achieve this end, therefore, it was decided to take the main salt sources in Indian States on lease and to obtain for the British Government from the salt producing Indian States of Rajasthan and Madhya Bharat on the basis of compensation, the right of taxing the salt of these States at the place of production and of strictly regulating its manufacture. The object of the British Government in assuming charge of salt manufacture at the Sambhar Lake was not to make a direct profit on the manufacture of salt but to secure against loss of revenue in the event of the abolition of the Customs Line and to develop the resources of the Lake so as to throw into the market a large quantity of good salt at a moderate price and thus help the consumer. The secondary object was to secure the abolition of all duties on the traffic levied by the old Indian States. The lease having proved successful, it was decided to abolish the Customs Line.

With this object in view, treaties were negotiated with Indian States of Rajasthan and Madhya Bharat and between the years 1869-1881 protracted negotiations relating to salt were carried on. The treaties provided for the lease to the British Government of the more productive sources, for the closure on payment of compensation of unimportant sources and the restriction on output at works left open under the management of the Darbars, the suppression of scattered earth salt manufacture, the abolition of transit duties and the removal of restrictions on the trade in salt which had paid duty to the British Government. The position in regard to the manufacture of salt, saltpetre and *Khari* in Indian States varied with the terms of individual treaties. Though in some treaties salt alone was mentioned, in a number of cases the Rulers undertook to prohibit absolutely the manufacturing of salt whether overtly or under the guise of manufacturing saltpetre or *Khari* or both. Some States in their treaties had secured

such a right and four States of—Jaisalmer, Udaipur, Gwalior and Datia had the right on certain conditions to manufacture salt itself. States like Jaipur and Jodhpur within whose jurisdiction the salt sources of Sambhar, Didwana and Pachbadra are situated were expected to give all possible help to British Government Officers.

Jaipur and Jodhpur.—The lease of Sambhar including Nawa and Gudha was taken in 1869-70 from these States on an annual rental of rupees seven lakhs plus a royalty of 40 per cent of the price of all salt sold annually in excess of 17,25,000 maunds and was distributed between the two States in the ratio of 3/8th and 5/8th respectively. This amount is now being paid to the Rajasthan Government. The royalty at present amounts to about rupees eight lakhs, varying of course, with the total clearance. The average annual payment during the five years ending with 1954-55 was Rs. 9,67,714. The lease of Pachbadra and Phalodi was taken from Jodhpur for an annual payment of Rs. 1,70,000 and Rs. 4,500 respectively and that of Didwana for Rs. 2,00,000. The States also received certain quantities of salt at concessional rates. Details are given later in the chapter.

Bharatpur.—The salt works were closed by the Maharaja in 1876-77. Bharatpur salt could not compete any longer with Sambhar salt, the price of which had been so much diminished by the reduction in the cost of production and transport, and by the abolition of transit duties since the opening of the Rajputana—Malwa (Now Western) Railway. It is said that the works then had an output of 40,000 tons per annum. No compensation was paid to the Maharaja, but Rs. 2,60,000 were paid to the manufacturers. By the terms of the agreement, salt on which duty had been levied by the British Government was the only salt which might be consumed in the State. The Maharaja received Rs. 1,50,000 annually and 1,000 maunds of salt free of duty.

Manufacture of salt went on in many States and similar agreements were entered into with all of them. Compensations under treaties were for political reasons fixed on a liberal scale and they included compensation for matters other than loss of salt making profits such as the right to establish British Courts in a foreign State, the right to impose a duty on salt and compensation for abandonment of various taxes. These amounted to Rs. 26,41,646/12/4 plus royalties due to Jaipur and Jodhpur States varying with the out-turn from Sambhar Lake averaging about Rs. 9,67,714 per annum. This is for Rajasthan and Madhya Bharat States. Moreover under treaty obligations the Salt Department gave 3,79,710 maunds of salt either free or for half duty or free of duty and price to these States. A general statement at pages 365-366 gives the names of the former Indian States and the amounts of cash and salt given to each.

(b) *Bombay.*—With a view to avoiding preventive lines and the consequent hardships to the public, arrangements were made with the maritime States, except those in Kathiawar Peninsula, and with Inland States in which there were such facilities, to stop manufacture in their territories. Such arrangements did not only effect large savings in preventive establishment, but also gave substantial protection to the revenue of the contracting States. Owing to the susceptibilities of different Chiefs, it was not possible to have uniform agreements with all the States. Some received cash payments, some were supplied with free salt, others got compensation in cash and kind for prohibiting manufacture in their territories.

(c) *Kathiawar*.—Earlier in 1853 agreements were made with the Chiefs of Kathiawar for the regulation of manufacture and the trade in salt. These arrangements were of three categories. The first was entered into with the six chiefs of maritime salt producing States viz., Junagadh, Nawanagar, Bhavnagar, Morvi, Jafarabad and Porbandar. The second was with the four chiefs of non-maritime and salt producing States viz., Limbdi, Lakhtar Mubir and Vola and the third with 27 inland chiefs viz., Vankaner, Palitana, Dhrol, Rajkot, Gondal, Wadhwan, Saliya, Chuda, Jasdan, Manawadar (Bantwa), Gidad and Bantwa, Lathi, Muli, Virpur, Kotda, Sangani, Jetpur, Mengni, Jalia, Gavridad, Pal, Gadhka, Vasavad, Dedan, Bagasra, Vichhavad, and Kuba. All the above named States had agreed to bind themselves to take such measures for the protection of British Salt revenue as were required by the local situation and circumstances of these States. They also agreed to stop exports to British territories, to produce only inferior or Ghasia stuff as opposed to Baragra salt and to restrict manufacture to the quantity required for consumption in Kathiawar. Manufacture of salt had been going on in Kathiawar for centuries. This right was conceded by the British Government on certain conditions which stipulated (1) no new sources to be opened, or old ones extended without the consent of the British Government; (2) consumption to be limited to States of Kathiawar; (3) States to prevent export of salt to British territory; (4) Government officers to be permitted to inspect the sources and (5) export by sea allowed from one port to another in the State. The Government of India later on sanctioned the export of sea salt produced in the maritime States of Kathiawar such as Nawanagar, Bhavnagar, Morvi and Porbandar to Bengal and foreign countries.

Dhrangadhra.—Under political pressure, an Agreement was signed in the year 1880 between the State and the British Government which restricted the State to produce annually only 90,000 maunds of salt. This quantity was intended to meet the local requirements only and its export to the British Indian markets was prohibited. This quantity was further reduced to 40,000 maunds by the Agreement of 1883 and, finally the Agreement of 1900 totally prohibited this State from manufacturing Baragara salt in its territories and a compensation of Rs. 7,000 a year was fixed. During the period of 1870—1900 the salt industry in the States of Kathiawar and Kutch in general, and in Dhrangadhra in particular had to face very violent restrictions as these States were outside the territorial jurisdiction of British India. In 1922-23 the Government of India restored to the State its right to manufacture both Baragara and Ghasia salts but the quantity of Baragara salt to be produced during the first five years was limited to 5 lakh maunds annually and this was to be purchased and distributed in the British India markets through the Salt Department. The annual payment of Rs. 7,000 was stopped in 1924. In addition, the State was also permitted to manufacture 50,000 maunds of salt annually for consumption within the State. This agreement was hailed by the Dhrangadhra State, which, after a lapse of about half a century was permitted to resume its production activities at Kuda in 1924, though in a very restricted way, and this, therefore, marked the beginning of the ancient industry in this State.

Kutch.—An agreement was entered into with the Rao of Kutch in 1885. He limited manufacture of salt to his requirements and stopped exports to British India, but was allowed to export by sea to foreign ports outside India. Outside Kathiawar no other State had a right to manufacture salt. They surrendered their rights under agreements.

Baroda.—The Gaekwar of Baroda entered into a similar agreement in 1887 putting the salt arrangements in his Kathiawar possessions on almost the same footing as obtained at that time in other States. The manufacture and collection of salt from places in which salt was spontaneously produced were prohibited and possession of traffic in salt was made illegal. In 1919 the Baroda State pressed for permission to open new salt works in its Kathiawar possessions to manufacture salt with a view to export it to Calcutta where foreign salt was imported in huge quantities and also to produce various by-products from bitterns. The Government of India agreed in 1922 to allow the State to export salt from Okhamandal and Kodinar under certain conditions. Exports from Baroda to foreign countries was permitted without any limit of tonnage. The State had given the manufacturing firm concessions granting them an exclusive right of manufacturing salt in Okhamandal for 30 years. The State received royalty and taxes amounting to Re.-/10/- a ton. In 1936 the Okha Salt Works were specially permitted to export refined table salt by sea or rail to British India. In 1941-42 at the request of these Works the Government further permitted movement of salt produced in maritime States by rail to Calcutta.

Other States.—In 1881 an agreement was entered into with the Nawab of Cambay under which he was paid Rs. 40,000 and given 500 maunds of salt annually.

In 1895 an agreement to regulate production and distribution of salt was entered into with the Chief of Bajana under which he undertook to prevent absolutely the making and removal of salt within his State except such quantity as might be required for *bona fide* consumption within the State limits.

Agreements were also entered into with Janjira and Savantvadi States under which these States agreed to give up their right to manufacture of salt on payment of annual cash compensation of Rs. 13,000 and Rs. 5,500 respectively. The Janjira State was also given duty free salt at the rate of 12 lbs. per head of population.

In 1880 manufacture of salt in southern Mahratta country and the Deccan was prohibited and the Chiefs and Jagirdars were paid cash compensation annually. Similarly the Chiefs of Patdi and Jhinjuvada and Nawabs of Palanpur and Radhanpur were given Rs. 10,521/12/3, Rs. 8,566/6/8, Rs. 500 and Rs. 11,048 respectively as compensation in cash in consideration of their rights to manufacture salt in the Rann having been sold to the British Government. Salt was issued free of duty in limited quantities for domestic consumption to the States of Radhanpur, Patdi and Jhinjuvada and also occasionally in replacement of duty paid salt proved to have been lost at sea before passing a preventive station.

Just as States in and outside Kathiawar surrendered their rights, similarly none of the Indian States within the area in which sea salt was consumed had the right to manufacture salt.

(d) *Madras.—Travancore-Cochin.*—Up to May 1865 the manufacture of salt in the States of Travancore and Cochin was a Government monopoly the selling price in Travancore being Rs. 1/1/- a maund and in Cochin 12 annas. By the Convention of that year, both States agreed to adopt the British Indian rates of duty and to raise the selling price at the inland depots "so as to place the salt of Cochin and Travancore and British India on the same footing in the market". Since then the selling price at Cochin and Travancore had followed the successive changes in the rates of duty

in British territory. Duty-free salt was also supplied to the Darbars from Madras at the nominal duty of 3 pies per maund under the terms of the treaty. Madras supplied to the States from Tuticorin factories.

The rules for the duty free supply of Madras salt to the two Darbars issued in March 1942 were as follows:—

- (i) The salt shall be carried in sealed bags and weighed on arrival;
- (ii) No allowance would be made for wastage in transit;
- (iii) Single duty at the rates in force in British India would be levied on all short deliveries;
- (iv) The duty so levied would be credited to the Darbar concerned.

Mysore.—Earth salt manufacture was a recognized local industry in Mysore State and was permitted under licenses issued by Revenue Officers. To prevent such salt finding its way into British territory export beyond the limits of the State was forbidden and the manufacture of salt in the State on the border of the British territory prohibited within five miles. The State obtained its supply from Bombay and Madras.

Nizam's Dominions.—Salt was made locally to a limited extent in Hyderabad, but the State had given an undertaking that it would not be exported into British territory. Supplies of salt were obtained from Bombay and Madras.

French Possessions.—Certain quantities of salt were annually supplied to the French Settlements in the Madras Presidency at cost price under an old Convention with the French Government. The Convention of 1818 renewed in 1837 stipulated that the British Government would deliver such quantity of salt as should suffice for the domestic use and consumption of the inhabitants of the French Settlements in India; the purchase, delivery and subsequent sale of the said quantity was regulated according to the stipulations contained in the Convention of 7th March, 1815. Under that Convention the French Government sold the salt at the price at which salt was sold by the British Government in the vicinity of the French Settlements. Besides this, cash compensation of Rs. 4,40,000 was paid annually to the French Government.

(e) *Bengal.*—Salt was purchased by the frontier tribes all along the Eastern and North-eastern frontiers but there were no special arrangements. The salt so purchased was all duty-paid.

French Possessions.—In 1815 a Convention was made with the French Government under the terms of which the East India Company agreed to supply sufficient salt for consumption in the French Settlement of Chandarnagar from the Orissa and Midnapore agencies. The quantities of salt supplied free of duty varied from 4,000 to 12,000 maunds per annum. This arrangement held good till 1839 when the Company entered into an agreement to pay a sum of Rs. 20,000 per annum to the French Government; since then salt which had paid duty to the British Government was consumed in the Settlement.

(f) *General Statement.*—The following statement gives the names of States or territories together with compensation in cash and kind paid to each:—

State or Territory	Compensation		
	Cash	Kind	
	Rs.	as.	p.
<i>Bengal</i>			
✓ French possession	20,000	0	0
<i>Bombay</i>			
Akalkot	142	0	10
Aundh	1,045	1	7
Cambay	40,000	0	0 500 mds. of duty-free salt.
Daphlapur	114	11	2
Jath	1,148	0	0
Janjira	13,000	0	0
Jamkhadi	1,490	12	9
Jhinjuvada	7,788	0	0 340½ mds. of duty-free salt.
Kurundvad (Senior)	1,193	9	0
Konher Rao Wadikar	8	12	0
Miraj (Senior)	62	1	2
Miraj (Junior)	6	12	0
Patdi	10,521	12	3 340½ mds. of duty-free salt.
Phaltan	2,010	9	9
Radhanpur	11,048	0	0"
Savantvadi	5,500	0	0
Savanur	32	0	0
Sangli	233	10	6
TOTAL BOMBAY	95,345	13	0 1,181 mds. salt

State or Territory	Compensation		
	Cash		Kind
	Rs.	As.	P.
<i>Madhya Bharat</i>			
Bhopal	10,000	0	0
Datia	10,000	0	0
Dewas (Senior and Junior)	825	0	0
Gwalior	3,12,500	0	0
Indore	61,875	0	0
Jaora	2,500	0	0
Narsingh Garh	618	12	0
Raj Garh	618	12	0
Rutlam	1,000	0	0
Sailana	412	8	0
Samphar	1,450	0	0
Sitamaui	2,000	0	0
TOTAL MADHYA BHARAT	4,03,800	0	0
<i>Madras</i>			
French Govt. in India	4,40,000	0	0
<i>Rajasthan</i>			
Ajmer Istamrardar	4,178	0	0
Alwar	88,300	0	0
Bikaner	10,000	0	0
Bharatpur	1,50,500	0	0
Bundi	8,000	0	0
Dholpur	25,788	0	0
Jaipur	6,88,309	2	7
Jhalawar	2,363	0	0
Jodhpur	9,61,395	5	3
Kaibania	105	0	0
Karauli	5,694	15	0
Kishangarh	33,000	0	0
Kotah	19,312	0	0
Lawa	700	0	0
Rampur . . . . .	..	
Mir Abdul Wahid and others	251	5	6
Shahpura	5,000	0	0
Sirohi	10,800	0	0
Tonk	20,000	0	0
Udaipur	2,04,150	0	0
TOTAL RAJASTHAN	22,37,846	12	4
GRAND TOTAL	31,96,992	9	4

1000 mds. salt free of duty and price

1,15,000 mds. salt at half duty.

1,000 mds. salt free of duty and price.

300 mds. salt free of duty and price.

7,000 mds. salt free of duty and price.

2,25,000 mds. salt free of duty and 24,000 mds. free of duty and price.

50 mds. salt free of duty and price.

50 mds. salt free of duty and price.

300 mds. salt free of duty and price.

10 mds. salt free of duty and price.

5,000 mds. salt free of duty.

3,79,710 mds. salt.

3,80,891 mds. salt.

II—POST-INTEGRATION PERIOD

After the abolition of duty on salt from 1st April, 1947 the position changed. The former Indian States were allowed to manufacture salt without any restriction in order to meet the shortage experienced in the country after partition. There was also integration of the States and it was decided that all salt compensations to States which merged with the Indian Provinces should stop from the date of the merger of those States. Therefore the salt compensation paid to some States like Baroda, Sirohi and Deccan, the payment was stopped from the date of their merger with Part A States.

The Indian States Finances Enquiry Committee appointed by the Ministry of States in 1948 in its report recommended as under:—

“There is no salt duty in any of the States covered by our Report; and any expenditure which may be incurred in connection with the arrangements for procurement, manufacture or distribution of salt has been ignored in our computations.

“In most cases, the payments formerly made by the Government of India to various States in Northern India in connection with salt manufacture and distribution have been continued under the Stand-Still agreements; it is understood, however, that the original agreements in this respect are at present under review by the Government of India in view of the abolition of the Salt duty within ‘British India’.

“The various ‘Salt’ payments and concessions made by the Government of India to the States may be classified under the following heads:—

(a) Payments in lieu of duty on salt required for consumption in the States; supply of salt duty free at concessional rates. (There are also some small payments of compensation on account of loss of salt revenue to Chiefs and Jagirdars these payments will also fall under this category.)

(b) Compensation for prohibition of salt manufacture within the States by any agency other than the Government of India, *i.e.* for surrender of rights of manufacture.

(c) Payments for services rendered (prevention of illicit manufacture, import and export etc.).

(d) Payments relating to lease amounts and Royalty in respect of salt sources in Rajasthan.

“Item (a) represents compensation for refraining from levying salt duty and is bound to disappear in any case, irrespective of Federal Financial Integration, as this is a “federal” subject and the Centre will not itself levy any salt duty; on the other hand, it is possible to regard such compensation as revenue that will be ‘lost’ to the State somewhat in the same way as Internal customs inasmuch as the State will be precluded from levying any duty on salt to make up for the loss. The amount involved has therefore been taken into account in our computation of the effects of Federal Financial Integration in such cases.

“Payments falling in categories (b), (c) and (d) have been left out of account in our integration calculations, as any revision of such payments will be matters for separate negotiation and settlement between the Government of India and the States, in the light of the policy of the Government of India in regard to the manufacture and distribution of salt by Union and non-Union agencies”.

Accordingly in the case of the States which merged to form Unions it was decided by the Ministry of States that salt compensation agreements with them would continue in force up to 31st March, 1950 and that the liabilities of the Government of India to pay compensation shall terminate with effect from the date of Federal Financial Integration with the exception of payments which are of commercial nature, such as rent whether payable in cash or kind, or royalties. After careful consideration a schedule of payments to the Rajasthan Government in respect of the Salt sources taken on lease was drawn up by the Government of India which has been incorporated in the agreement entered into between the President of India and the Rajpramukh of the Union. Relevant extract from this agreement is reproduced below:—

“All Salt Compensation Agreements shall continue in force up to 31st March, 1950. The liabilities of the Government of India under these agreements shall terminate with effect from the date of Federal Financial Integration with the exception of payments as per the Schedule annexed hereto which are of a commercial character, such as rent whether payable in cash or kind, and Royalties. The Government of Rajasthan will be at liberty in respect of such continuing payments to enter into separate negotiations with the Government of India for their modification in such a manner and to such extent as may be mutually agreed upon; such modifications will be effected from 1st April, 1950.”

Schedule of payments to Rajasthan Government which continue after 31st March, 1950 on account of the Manufacture of Salt in Rajasthan.

Item No.	Reference to original Treaty.	Article No.	Amount payable annually or quantity of salt	Remarks
1	2	3	4	5
1. Jaipur	1869 Treaty	XI	Rs. 1,25,000	Rent for the lease of Sambhar Shamlat (joint) salt area.
2. Do	Do	XII	Royalty at 20% on the price per md. of salt, on salt sold in excess of 8,25,000 mds.	There is some doubt as to whether there is a 'duty' element included in the Royalty payments, but the Govt. of India are prepared to accept the entire Royalty as a commercial payment.
3. Do	1879 Treaty	VII	Rents actually being paid by the Govt. of Rajasthan to the original grantees or to their successors subject to the maximum of (i) Rs. 8,000 to Rao of Khandel. (ii) Rs. 3,000 to Thakur of Kachor.	

1	2	3	4	5
4. Jaipur	1879 Treaty	VIII	An amount actually being paid by the Govt. of Rajasthan to the landholders of certain villages detailed in the Schedule (A) on page 86 of Aitchison Treaties, Vol. III, subject to a maximum of Rs. 2,309/2/7.	
5. Jodhpur	1870 First Treaty.	XI	Rs. 1,25,000	Rent for the lease of Sambhar Shamlat (joint) salt area.
6. Do	Do	XII	Royalty at 20% on price per md. of salt on salt sold in excess of 8,25,000 maunds.	Vide remarks against item 2 above.
7. Do	1870 Second Treaty.	XI	Rs. 3,00,000	Rent for the lease of tracts of Sambhar salt area belonging exclusively to Jodhpur.
8. Do	Do	XII	Royalty at 40% on price per md. of salt, on salt sold in excess of 9,00,000 mds.	Vide remarks against item 2 above.
9. Do	1879 Treaty	VI	Rs. 3,91,800	Rent for the lease of salt sources, viz., Pachbadra, Didwana, Phalodi and the Luni Tract.
10. Do	Do	VII	Rents actually being paid by the Govt. of Rajasthan to Jagirdars for the shares in salt works detailed in Schedule (A) on pp. 160-162 of Aitchison Treaties, Vol. III, subject to a maximum of Rs. 19,595/5/3.	
11. Do	Do	XI	Profit sharing 50%	
12. Do	Do	XII	2,25,000 mds. at Re.-/8/- per md. of salt.	Rent in kind."

Besides above, a sum of Rs. 10,521/12/3 per annum is paid to the Chief of Patdi whose salt pans were taken over by the British Government and merged with the Kharaghoda salt works.

Compensation paid to the French Government in respect of Chandarnagar terminated from the date of its merger with the Indian Union i.e. 2nd May, 1950. Salt Conventions of 1815 and 1837 with the French Government were also terminated with effect from 14th February, 1951 and 14th August, 1951 respectively when the period of notice cancelling the above Conventions expired.

In the former Bombay and Madras States there were certain individuals who used to get salt compensation. The question of final liquidation of these payments is still under consideration of the Government of India.

CHAPTER XVII

STANDARDS AND QUALITY

Common salt is essentially sodium chloride and its quality is determined by its sodium chloride content; the higher the percentage, the purer the salt. It has an intimate bearing on human health. Besides human requirement of good quality salt high purity salt is necessary for all kinds of heavy chemical industries which use salt as the basic material. In America and other advanced countries, salt of as high as 99.9 per cent purity is manufactured and offered for sale. In India before the abolition of salt duty, the Government's main attention was towards revenue and as such no serious steps were taken towards improving the quality of indigenous salt. In a letter written in May, 1876 to the Madras Salt Commissioner, Dr. Ratton observed:

"A Government of other days took over the salt pans just as it found them and organised the Salt Department exclusively as a machine for collecting revenue leaving the salt to be made, as it was and is still entirely by coolies. The officers in this Department never received any scientific training and were never asked any question about salt manufacture on appointment."

A.—NECESSITY OF GOOD QUALITY SALT

The presence of salts like magnesium chloride, calcium sulphate, sodium sulphate and sodium carbonate is considered undesirable and their traces are at best treated as unavoidable impurities. Magnesium chloride and sulphate being hygroscopic are looked upon as particularly undesirable impurities. To make salt for table use, free flowing and to prevent it from caking, magnesium carbonate or calcium phosphate, subject to a limit of 1 per cent is added to it. The quality of salt depends upon the quality of the brine used and apart from the sodium chloride content it is correlated with its physical characteristics, viz., its colour and particle size. The colour of salt should be as white as possible and this is easily achieved when salt is manufactured by artificial evaporators where discolouration by insoluble impurities like clay or dirt does not occur. In the case of solar salt, the colour can be controlled to a large extent by not disturbing the bed of the crystallisers at the time of scraping and by washing the crystals either in the pans or subsequently in a mechanical washery. The size of the crystals is also controlled in order to suit the requirements of the consumers. For table use, the finer the crystals, the better the quality of salt. In artificial evaporation, crystallisation is carefully regulated so that small, uniform size, solid, cubic crystals are obtained. In the solar evaporation process, however, the size of the crystals depends upon the method of collection of crop and is apt to vary considerably. Where the single irrigation system is practised the crystals are generally small but hollow, but under multiple irrigation the crystals are large and compact. To obtain a uniform size, the crystals are sometimes ground by passing them through roller mills and sieving them through sieves of different meshes. When salt is screened, the coarser crystals are purer than the finer ones and by successive grinding and screening the quality of the salt retained on the sieve progressively improves. Rock salt is also crushed and sieved to classify it in respect of its grain size.

It is commonly felt that crudest salt that is produced including any salt that gets dirty and becomes too unsightly for sale and human consumption, is good enough for fisheries. In fact the only distinction between edible salt and salt for fisheries is that the latter should be in larger crystals so that it may not dissolve too rapidly and leak out whilst fish are being dried. The presence of magnesium salt is reported to spoil the texture of the fish tissues and therefore should be avoided in the preservation of fish. It is because of the ignorance of this principle, fish cured in India is held to be of poor quality and is consumed only by the poorest people. If salt of good quality and large crystals were used, the preserved fish would not get spoilt during storage and would fetch a higher price both in the Indian and export markets.

The chemical industries which employ salt as a raw material are in a nascent state in India. Contrary to the belief of the salt manufacturers, salt which is unfit for human consumption is equally unsuitable for most industrial uses. There are several instances where chemical manufacturers are incurring high cost in the purification of the salt used by them to make it suitable for their manufacturing process. In the electrolytic process, the presence of sulphate is a serious drawback, which can be removed only by the addition of barium chloride which is a costly chemical. This adds to the cost of the chemicals produced and it is essential for the country's economy that the industries should obtain salt of good quality. The quality of salt for agricultural purposes has to be determined from entirely different considerations. Insoluble impurities do not render salt unfit for agricultural purposes, but the soluble impurities, particularly magnesium salts above a certain percentage should be excluded.

In view of the general ignorance about the quality of salt required for different uses, it is necessary that standards for different requirements should be laid down.

B—DEFECTS IN SALT MANUFACTURE

Mainly due to the following defects the quality of Indian salt is generally below the mark and much poorer in quality than foreign salt:

(i) In commenting on the method of shallow irrigation practised in Madras, which for reasons of climate is generally regarded as the best method of manufacture in that part of the country, Dr. Ratton observed that as with many other things, in regard to salt also, there was right way and a wrong way. He observed that:—

“Many of them at least, in following traditional lines of practice, clung to the wrong way. In the first instance all used irrigations of weak brine, much too shallow, which soften the clay pan floors, first by reason of the weakness alone, and secondly because they are not dense enough to resist wind motion; and these evaporating leave but a scum or film of wretched crystals imbedded in the mud bad treatment for the pan floors, (which) leads subsequently to the production of dirty salt. It is not the use of shallow irrigation alone, but of shallow irrigation of weak and muddy brine permitted to evaporate to too high a degree of density and allowed to mingle with strong magnesian mother liquors, which force sodium chloride to separate rapidly, which is accountable for the production of bad crystals. The impurity of the salt is due to the same causes, The remedy for all this is to be found in the proper use of the hydrometer.

pathways and bunds, if not constantly watered and tamped, dry up and furnish a large quantity of dust which drifts on to the bed of salt crystals. . . . At each scraping the clay bed floor is raked up and the salt crystals receive a baptism of mud".

(ii) Another factor which has adversely affected manufacturing methods is the practice of selling salt by measure instead of by weight. This has led the trade to call for a light flaky salt, yielding a comparatively large bulk for weight which not only gives the consumer less real salt for his money but also encourages faulty methods of manufacture and leads to the production of a comparatively impure salt.

(iii) Again, it is asserted by the trade that consumers in many parts of India prefer a brown, red or dark grey salt to one which is pure white and otherwise clean and salt is deliberately muddied in order to satisfy this alleged liking. How far this performance is a fact or is genuine performance or is alleged or fostered by the trade in order to afford cover to sharp practice; it is impossible to say; but even if certain sections of the public should, in their ignorance, prefer a coloured to a white salt, they should be educated out of this prejudice and taught to appreciate the advantage of a clean and chemically pure salt

C.—CAUSES OF PRODUCTION OF POOR QUALITY SALT

(i) *Gandhi-Irwin Pact and production of poor quality salt in villages.*—Mahatma Gandhi's idea was that the poor people living in salt producing areas should be allowed to make their own salt and market the same in their own locality without restriction. People took advantage of this and began to manufacture salt without any regard to quality. As salt has intimate bearing on human health, Government attach considerable importance to the quality of salt manufactured by such unlicensed manufacturers; so while issuing the Press Note dated 23-4-1948 liberalising the Gandhi-Irwin Pact permitting individuals or group of individuals to produce salt freely on land less than 10 acres, the Government of India notified that "while the high quality of salt produced by large scale factories will automatically set a standard inviting emulation by small-scale manufacturers, Government reserve the right to take suitable preventive measures against the sale of unwholesome salt for human consumption". In spite of this provision in the Press Note, the quality of this production left much to be desired, as it has not been practicable to enforce proper check on such manufacture mainly owing to the inadequacy of staff. The Government of India have, therefore, been considering measures to enforce quality control on this salt also.

(ii) *Sale of salt by measure.*—In Bombay, Madras, Mysore, Travancore-Cochin, etc. salt is generally sold in retail by measure though the wholesale transactions are by weight. This encourages production of light variety of salt as it allows better profit to dealers. The light varieties of salt are mostly inferior in quality. It was, therefore, considered necessary that suitable legislative measures should be adopted to have wholesale and retail sales by weight only. This would result in elimination of the production of light varieties of salt. Consequently Bombay Government was addressed in the first instance in the matter. That Government amended their Weights and Measures Act suitably and issued a notification dated 10th November, 1949 prescribing that salt in quantities of half seer and above should

be sold by weight instead of by measure. This, however, was made applicable to the City of Bombay in the first instance. Similarly, the Government of Madras amended their Weights and Measures Act banning the sale of salt by measure. The Madras Government also applied the amended Act by issue of a notification dated the 10th December, 1952, to the City of Madras alone, presumably on the analogy of the Bombay Government order with a view to watching its working before extending it to the other areas in the State. On further request from the Salt Department the Bombay Government extended the application of the amended Act to the whole of Bombay State with effect from 1-8-1951 under their notification No. WMA-1051 dated the 30th April, 1951. Although the Governments of Bombay and Madras took steps to amend their Weights and Measures Act with a view to stop the sale of salt by measure, they did not enforce the enactment properly with the result that salt continued to be sold by measure and therefore the production of light varieties of salt went on unabated in both the States. The Central Government has again requested both these Governments to enforce their enactments properly. The adjoining States of Andhra, Travancore-Cochin and Madhya Bharat have also been addressed to adopt similar legislative measures. The Madras Government have, however, since informed that they have not been able to enforce the Act due to lack of staff. The Bombay Government has promised to enforce the Acts. The Salt Department has, however, been keeping a watch and pressing the State Governments to take effective steps to enforce the sale of salt by weight more effectively.

(iii) *Misconception in India about quality of salt.*—In India, apart from lack of standards, there are peculiar misconceptions about the quality of salt required for various uses. It has been argued that since in many other countries, national standards have not been laid down for common edible salt, there is no need to prescribe any such standard for India. The fact of the matter is that in these countries the standard of common salt is so high that there is no need to prescribe a rigid specification for it. It has been suggested that solar salt is a natural product and does not need to be and cannot be bound by specifications and standards. A plea has been advanced that the common impurities in salt are not harmful and that on the contrary they are essential to the human system and their removal would render the salt unwholesome in the same manner as the removal of vitamins from food materials. The contamination with calcium sulphate which results from carelessness in the proper fractionation of salt during its separation from brine is looked upon a blessing in disguise under a mistaken notion that it provides calcium for the body.

D.—FOREIGN STANDARDS AND SPECIFICATIONS OF SALT: STANDARDISATION OF INDIAN SALT

Foreign standards.—Specifications and average composition of salt in some of the foreign countries are generally as shown on the next page.

This table shows the importance that is attached to the purity of salt in foreign countries not only for domestic uses but also for industrial purposes. In U. S. A. even for the treatment of road surfaces, the sodium chloride content has been fixed as high as at 98% while in India some of the manufacturers are reluctant to make salt higher than 90 per cent even for human consumption.

(Percent on dry basis)

Specifications for specific uses.

	U.K.			U.S.A.			Specification of daily salt		Specifications for specific uses.			
	Electro-lysis (U.S.A.)	Pure Vacuum salt	Open pan salt	Crude	Refined	Table salt	U.S.A.	U.K.	Fish-Curing South Africa	Hide-Curing South Africa	Fishery U.K.	Fishing and Pickle U.S.A.
Sodium chloride	98.56	99.930	98.85	93.86	99.7	99.70	97.5	99.7	98.6	92.3	99.15	99.5 to 99.7
Calcium sulphate	0.40	Trace	0.85	0.41	0.024	0.20	1.4	..	0.1 (Max.)	0.3	0.55	0.25 to 0.38
Magnesium sulphate	..	Not specified	Not specified	Nil	Nil	..	..	0.03	..	4.5	..	..
Sodium sulphate	..	0.056	0.25	3.78	0.055	0.06	..	..	..	..	0.25	0.1 to 0.5
Magnesium chloride	..	Trace	0.23	1.91	0.034	0.03	0.5	0.01	0.01	0.2	0.03	0.03 to 0.04
Insolubles	0.57	Not specified	0.02	0.04	0.010	0.1	0.1	0.03	0.1	0.1 (iron)	0.2	0.02 to 0.04
Unspecified	0.49	..	..	..	..	..	..	0.0028 (iron, copper, arsenic, Lead)	..	0.8 (Carbonate)	..	..

E.—STEPS FOR IMPROVEMENT OF QUALITY OF INDIAN SALT

Until 1927 the Salt Department, specially in Madras region, insisted on the observance of certain conditions for the manufacture of salt by the licensees, which would result in the production of standard or purer quality of salt. In 1947, all these conditions were abolished and more stress was laid on the quantum of production as a result of which the licensees were free to produce any quality. The Department, however, laid stress on the physical characteristics of salt produced in the Government salt works, but no serious attempt was made to improve the overall quality of production. For instance, a Circular was issued in this regard by the Central Board of Revenue in October, 1947 but not much was done to enforce it. In the Madras factories one of the conditions in the Excise and Modified Excise systems of licensing stipulated that the licensee shall manufacture salt of a quality not inferior to the standard prescribed and the Salt Department could destroy any salt which was not up to the standard. However, this rule was not enforced strictly.

It was in 1948, that the Salt Experts' Committee in their interim report pointed out the necessity for having a standard for the salt and suggested that the Indian Standards Institution, which had been constituted, should be asked to draw up the standard of salt for edible purposes.

At the time of abolition of duty in 1947, the Finance Minister stated that "Government's interest in the Salt Industry should be directed towards developing India's salt resources to their full potential, improving the quality of the salt and making sufficient grades to provide for all classes of consumers.....". The Patel Committee which was appointed in 1947 to enquire and report about the Salt Industry in the country also laid stress on the improvement of the quality of Indian salt. They even suggested that the Government of India should issue a Control Order under the Essential Supplies (Temporary Powers) Act, 1946, in which regulation of quality of salt should be one of the important items of control. The Salt Control Order was not, however, issued. The first step towards improvement of quality on the all India basis was practically taken after the abolition of duty. The Central Board of Revenue in their circular letter C. No. 320-Salt/46 dated 24-10-1947 to the Collectors of Central Excise, Allahabad/Calcutta/Madras/Bombay, approved the following standard of purity of salt.

"1. Salt should be clean and white in appearance.

2. Chemically the salt as marked, should not contain more than 6.5% moisture. The total solid should not contain less than 96.25% of Sodium Chloride and not more than 1.5% insoluble matter both organic and inorganic, of the associated salt Magnesium chloride and Sodium Carbonate should not exceed 1.2% and no other allied salt may exceed 1%."

This letter also indicated that as it was not possible to change the manufacturing method all of a sudden, manufacture of different grades of salt might be allowed to continue. Action to improve the quality of salt should, however, be firm but gradual so as not to affect supplies. The results of the action taken and the improvement brought about thereby in the quality of the salt manufactured might be reviewed at the close of the manufacturing seasons for the Board's information.

As no tangible results were achieved, especially due to change of Ministries (from the Finance to the Industry and Supply), the Salt Controller, Government of India had to issue a circular on 24-3-1949 [C. No. XIII (I) Salt (P)/49, dated 24-3-1949].

"In view of the necessity to maintain a standard of purity for salt cleared for human consumption, all licensees should be warned that salt containing less than 92% sodium chloride will not be passed for the purpose".

F.—STANDARDISATION OF EDIBLE SALT

As observed above, prior to 1950, no serious attempt was made to standardise the quality of salt by the appropriate authority and to lay down specifications for its various grades. No method of collection of samples was prescribed and generally only picked samples which appeared on visual examination to be the best were sent for analysis. No systematic record of analysis was also kept either by the officers of the Salt Department or the manufacturers themselves. They, in the absence of proper technical men in their staff, had therefore, no idea as to how the result of analysis should be interpreted and how to use the results of analysis for keeping control over the quality, of their production. In 1950, the Indian Standards Institution finalised specification for edible salt and fixed 96% NaCl content as the minimum standard of this variety of salt. The Salt Department was further asked to achieve this standard in three years. The Indian Standards Institution provided that the minimum sodium chloride content in edible salt on moisture free basis should be 96 per cent, matter insoluble in water not more than 1 per cent and matter soluble in water, other than sodium chloride not more than 3 per cent. The specification also lays down some of the physical characteristics of salt viz., colour and visible impurities. The moisture content of the salt has also been specified and a formula has been laid down for rebate in price on account of excessive moisture. It gives in detail the methods of tests and prescribes how the result of analysis should be reported. It also includes methods of sampling of salt. The tentative specification for edible common salt circulated by the Indian Standards Institution by their notification No. IS:253-1950 is given in Appendix No. III.

The Salt Experts' Committee, however, considered this minimum standard of 96% sodium chloride for edible salt as on the low side and said that it should have been fixed at 97·5%.

The recommendation of the Salt Experts' Committee and the standard prescribed by the Indian Standards Institution were accepted by the Government and in 1950, Government took first step towards raising the quality of production by prescribing a minimum standard of 92 per cent sodium chloride content for all salt manufactured in the country for sale for human consumption. It was also decided by the Government that the standard of 96% should be reached in course of 3 years starting from 1951. Numerous protests were received against the enforcement of even this standard of 92% on the plea that the production in the country would suffer. On the advice of the Salt Advisory Committee this low standard was not progressively raised as it was felt that self-sufficiency was the first goal to be achieved before the question of improvement of quality could be taken up.

The Salt Advisory Committee, however, recommended that the standard of 92% sodium chloride content should be strictly enforced and a Press Note to that effect was issued by the Government on 13-8-1951. It was also indicated therein that the standard of salt meant for human consumption would be progressively raised from 92% in 1951 to 94% in 1952 and 96% in 1953 to achieve the standard prescribed by the Indian Standard Institutions.

Several representations were received in 1952 from the salt manufacturers and their Associations stating that the rise in sodium chloride content from 92% in 1951 to 94% in 1952 was difficult to attain in practice, in course of a year, and that they had not been able to improve their quality to that extent. They further represented that the ban imposed on the sale of lower quality salt had resulted in serious hardship in some cases. After careful consideration of these representations, Government revised the above order and by issue of Press Notes dated 21st July, 1952 and 22nd August, 1952, fixed the minimum standard for salt in 1952 at 93% sodium chloride content with a further relaxation by which fractions of 0.5 were rounded off to one thus allowing salt of 92.5% to be released for human consumption. In 1953, the standard fixed was 94% (in actual practice 93.5%). In 1954, because of the many representations received from the salt manufacturers and their Associations it was decided by the Government by issue of a Press Note dated 19-12-1953 to maintain the minimum standard for salt for human consumption at 94%. The rise over the standard was therefore 0.5 per cent only.

While considering the standard for 1955 manufacturing season it was felt that it would be difficult for the small holdings in the country to attain a higher percentage of purity than 94% without realignment of salt works on scientific lines. In order, therefore, to enable these small works to realign themselves before the end of 1955, it was decided that the standard for salt for human consumption during 1955 manufacturing season should remain at 94% sodium chloride content. The salt manufacturers have, however, been fully warned that Government's aim remains the attainment of the standard of 96% as early as possible and they have been asked to make necessary arrangements for improving their production by realignment of their holdings, where necessary with a view to attaining the standard of 96% in the near future. For the proper guidance of the salt manufacturers, pamphlets in the Regional non-technical languages had been printed and distributed free. A chain of test laboratories is also being established in the Regions to guide the manufacturers at the different stages of manufacture and for enforcement of quality control.

As a result of the enforcement of quality control the quantity of salt banned in Madras and Bombay Regions (the salt produced in other regions is much above the standard prescribed) is indicated in the following statement:—

(Figures in '000 maunds)

Region and Year	Total Production	Quantity banned	Percentage of banned salt to total production	Prescribed standard.
<i>Madras</i>				
1951	1,95,51	1,86	1%	92%
1952	1,82,42	3,69	2%	92.5%
1953	1,96,00	6,95	3.5%	93.5%
1954	1,66,22	9,38	5%	94%
1955	1,54,99	10,71	6.9%	94%

(Figures in '000 maunds)

Region and Year	Total Production	Quantity banned	Percentage of banned salt to total production	Prescribed standard
Bombay				
1951	1,75,80	5,34	2%	} As shown against Madras
1952	2,12,02	4,00	1.4%	
1953	2,18,16	59	3%	
1954	2,16,18	36	1%	

Even though the standard has been progressively raised, the quantity of salt banned has not increased much. The salt manufacturers have gradually been realising that the desirability of improving the quality of their salt is in their interest in particular and salt industry in the country as a whole.

(a) *Minimum standard of salt for fish-curing; hides curing; heavy chemical industries, etc.*—The Indian Standards Institution have since prescribed tentatively the minimum standards of salt for fish curing and hide and skin curing also which are 96% and 81% sodium chloride contents respectively. As regards others, these are still under examination of the Indian Standards Institution.

(b) *Recommendations of the Salt Experts' Committee.*—In order to achieve the required standards of purity it is necessary to set up model salt farms, salt research stations to demonstrate to the manufacturers the improved method of manufacture not only for superior quality salt but also to reduce the cost of manufacture, and test laboratories for quick analysis of salt samples. The Salt Experts' Committee (1950) recommended that:—

- (i) Owing to the primitive stage of development in the salt industry, in most of the centres, it is necessary to set up model factories in principal salt producing centres. There should be 7 model factories in India, two in Bombay State, three in Madras State including Andhra and one each in Travancore and Orissa. In the 3 model factories of Bombay, Travancore and Madras research units should also be set up for investigating methods for improving the quality and yield of salt;
- (ii) A separate research station should also be set up at Sambhar;
- (iii) The Salt Research Committee of the Council of Scientific and Industrial Research and those research units in the model factories should work in close collaboration with each other, in order that there is no overlapping of work;
- (iv) The minimum standard of sodium chloride for edible salt prescribed by the Indian Standards Institution is on the low side and should be raised to at least 97.5%;
- (v) The Salt Department should arrange to collect systematically samples of salt regularly from the various factories and have them analysed. Salt below standard should either be denatured or destroyed and its sale as edible salt prevented. The provisions of Food Adulteration Act should be applied to edible salt;

- (vi) The larger factories should set up their own control laboratories and the small manufacturers should at least carry out visual rapid tests for assessing the quality of their product. Suitable rapid methods of assay should be developed after research, if necessary, and made available in the form of a code of practice;
- (vii) Routine records of densities and analysis should be maintained in each factory and the Salt Department should examine how far and to what extent the maintenance of these records can be made obligatory as a condition of the grant of licenses; etc. etc.

(c) *Model Salt Farms and Salt Research Stations.*—As a consequence to the Salt Experts' Committee's recommendations, a Model Salt Farm with a research unit was established at Wadala in Bombay in 1951-52. This has been working satisfactorily and has been of great use to the manufacturers especially of Bombay. The Bombay shillotries had since long been manufacturing 'Mapi' (light quality) variety of salt. After demonstrations by the above Model Salt Farm, many of the shillotries in this State have now been manufacturing Karkutch (vajni or heavy quality) variety salt, which has been finding a good market in North Bihar which was all along a monopoly market of imported salt from other countries. It was decided to start two more Model Salt Farms at Levingipuram (Madras-Tuticorin Circle) and Sumadi (Orissa). At Levingipuram the Model Farm is being run by one of the licencees under the guidance of the Salt Department and he is realigning the works according to Government directions. At Sumadi estimates, etc. have been sanctioned and the Farm is expected to be started during 1956.

Besides the above model farms, a Central Salt Research Station was established at Bhavnagar in Saurashtra in 1952-53, under the administrative control of the Council of Scientific and Industrial Research.

Test Laboratories.—When 'Salt' was separated from the Central Excise in 1948, there was only one small laboratory attached to the Deodani Circle in the R. S. S. Division, Sambhar Lake. The working in the laboratory was a spare time activity for the Circle Officer and the staff posted in Deodani Circle.

On the advice of the Salt Experts' Committee, expansion of the laboratory at Sambhar Lake was taken in hand. Another laboratory was opened at Wadala in 1949 and it was attached to the Model Salt Farm there. In order to cater to the needs of the salt factories in the Madras Region two laboratories were opened in 1952, one at Tondiarpet and the other at Tuticorin. For the opening of the laboratory at Tuticorin, the Tuticorin Salt Manufacturers' and Merchants' Association supplied necessary equipment and chemicals for running the laboratory under the management of the Department.

As stated above enforcement of quality control in the true sense commenced only in 1950. As the Salt Department had no departmental laboratories in the Madras Region, samples of salt were used to be sent for analysis to the Kings Institute, Guindy. A testing fee of Rs. 35 per sample was charged by the Institute. When analysis reports on any special samples were required, by the Central office, the samples were sent to the Central Control Laboratory of the Central Board of Revenue at New Delhi. That Laboratory also charged Rs. 35 per sample. Thus, heavy expenditure had to be incurred on analysis of salt samples.

With the fixation of the minimum standard for edible salt and for its proper enforcement Government needed more test laboratories where samples of salt could be analysed early so that salt found below the standard could be banned for sale for human consumption. Test Laboratories at Tondiarpet, Tuticorin, Kakinada, Nagercoil, Naupada and Cuddalore (Madras Region); Humma (Calcutta Region); Wadala, Kharaghoda, Uran (Bombay Region); Sambhar Lake and at Mandi are functioning at present. 15 more laboratories have been set up in different Regions during 1955-56. In addition to these many more are to be set up in the years to follow.

The main function of these laboratories has been to analyse the samples of salt drawn from the produce of various factories with a view to ascertain the sodium chloride content of the produce. If the sodium chloride content is found to be below standard, further clearances of salt are banned. The clearances of salt, are, however, allowed till the results of analysis of the salt samples are known. As the number of laboratories including those proposed to be set up is small and their capacity for analysis of salt samples is also limited, it has been taking a long time in completing the analysis of samples received in the laboratories. There have been complaints from the individual manufacturers and their Associations that this method of analysis and of enforcing quality control is not correct. From the point of view of the consumers also the method is not fool-proof as considerable quantities of salt are allowed to go into the market for sale even though the samples analysed later may reveal that the produce was sub-standard in quality.

During 1950 when the specification for edible salt was prescribed by the Indian Standards Institution, it suggested that the Salt Department should take necessary steps to attain the minimum standard of 96% sodium chloride progressively in three years beginning from 1950. During the last five years, such minimum standard has been raised only up to 94% and that too with great difficulty. So, with a view to attain the maximum more expeditiously not only for indigenous marketing of salt but also to export surplus salt to foreign countries, it is absolutely necessary to establish more test laboratories at least in big units so that analysis of brine and salt in the course of manufacture and of the finished products could be conducted on the spot and the analysis reports are made available to the manufacturers in time so that they may take immediate steps not to store sub-standard quality of salt. The State Governments particularly, Madras Government, also have been advocating the setting up of laboratories for separate factories.

G.—GOOD QUALITY SALT AND EXPORT MARKET

The country has attained self-sufficiency in salt and has considerable surplus stocks, especially in Madras, Andhra and Bombay. The present prospective export market of Indian salt is the Japanese market, which purchases good quality salt only. Such salt is being exported at present from Saurashtra and Kutch. In spite of allowing exports from Bombay and Madras ports to Japan and other foreign countries on 'free licensing', no salt is being exported from these States, owing to the quality of their salt not being up to the standard. So, until the manufacturers in these States take serious steps to improve the quality to the required standard as early as possible, the surplus production in these States is not likely to benefit them for want of adequate markets in foreign countries.

H.—REFINED SALT

Before the partition of the country in 1947, there was no difficulty in regard to salt, except the transport bottlenecks created temporarily during war periods. The Northern India was getting its supplies from Sambhar and the Salt Mines. In the Eastern parts of the country foreign salt was flowing freely. Bombay and Madras catered to the needs of Southern and Western India.

As a result of the partition, rock salt mines went to Pakistan, but this salt continued to come to India till 1950 when its import was suspended. The necessity to cater to the needs of the rock salt consuming public was felt greatly and some entrepreneurs started refining salt and placing the same on the market. Government of India also encouraged their setting up by granting salt quotas and recommending to the State Governments the grant of coal quotas to these refineries. This became quite popular and a number of refineries were started in Punjab, Delhi and U. P. Their number increased progressively, as will be seen from the following figures:—

Year	Total No. of refineries.	Total quantity of salt lifted in wagons (1 wagon : 295 mds)	Estimated quantity of refined salt produced.
			Mds.
1951	9	181 wagons	43,400
1952	24	567 „	1,36,080
1953	27	807 „	1,93,680
1954	26	843 „	2,02,320
1955	25	1,082 „	2,59,680
1956	28	788 „	1,89,120

(Upto Aug.)

In addition to these there are four more refineries, three in South (Kannupatry, Tuticorin and Kelambakkam) and one at Mithapur.

The process of refining is quite simple. The ordinary crude Sambhar salt is lixiviated in water and the brine is then recrystallised in open pans by artificial heat (coal fire). The result is pure white granular refined salt, impurities having settled down in the process of refining.

This salt gained popularity day by day and was sold at quite reasonable rates i.e. Re. -/2/6 to Re. -/3/- per seer as against the foreign table salt sold at Re. -/6/- per lb. or Re. -/12/- per seer. Certain unscrupulous refiners, however, planned and started deceiving the innocent public by fusing the crude Sambhar salt into blocks and breaking them into irregular pieces to pass the broken salt as rock salt and hoodwink the public. They sold this spurious product which cost them Rs. 4/- to Rs. 5/- per maund at rates varying from Rs. 15/- to Rs. 20/- per maund or even more and began to reap disproportionately high profits. This immediately attracted the Government's attention and they, in consultation with the State Governments concerned, took measures to check the nefarious activities of such unsocial elements. They cancelled their salt quotas and the State Governments imposed restrictions on the manufacture, sale and movement of this salt. Block salt manufacturers then started moving this salt under a different garb and called it as alum. This practice had also to be checked up by Government by detecting such consignments and banning their export.

CHAPTER XVIII

ANALYSIS OF SALT

When India became independent and the country was partitioned in 1947, rock salt mines went to Pakistan. Government attention was, therefore, focussed on augmenting the supply of salt by increased production in the country. The necessity was felt all the more when the imports of rock salt from Pakistan were suspended in 1950. This resulted in haphazard growth of salt works in the private sector with little attention on quality of salt. The need to improve quality was, however, soon realised and steps taken immediately to improve the quality, as given in detail in the "Standards and Quality" Chapter. Here we are concerned only with the analysis of salt of different varieties of salt.

In India different qualities of salt are produced in different parts and their composition also differs. The main sources of salt are:—

- (i) Sea salt in all the coastal areas;
- (ii) Lake salt in the Rajasthan;
- (iii) Inland (sub-soil) salt in the Little Rann of Kutch;
- (iv) Rock salt from Mandi mines.

I. Sea-Salt.—Marine salt contains, besides sodium chloride, small amounts of calcium sulphate, magnesium chloride and magnesium sulphate. The amounts of potassium chloride and magnesium bromide present are negligible and can be ignored in routine analyses of salt. On account of the presence of these impurities, sodium chloride in marine salt is determined by an indirect method which involves the estimation of calcium, magnesium, sulphate and chloride content of the salt. We have found that calcium sulphate, magnesium sulphate and sodium chloride are insoluble in anhydrous amyl alcohol, while magnesium chloride is readily soluble. Hence, this property of magnesium chloride was taken advantage of in the direct estimation of sodium chloride in marine salt.

Sea salt is produced in Bombay, Madras, Saurashtra, Kutch, West Bengal and Orissa. In Bombay the following types of salt are manufactured:—

- (i) Kuppa, (ii) Karkutch, and (iii) Vajni.

Results of analysis of these salts are given below:—

(a) BOMBAY

<i>Kuppa Salt</i>	Per cent
Sodium chloride	96.67
Calcium sulphate	0.34
Magnesium sulphate	1.15
Magnesium chloride	1.81
Insolubles	0.03
Moisture	11.25

Karkutch Salt

Sodium chloride	97.31
Calcium sulphate	0.67
Magnesium sulphate	0.86
Magnesium chloride	1.12
Insolubles	0.04
Moisture	5.24

Vajni Salt

Sodium chloride	93.05
Calcium sulphate	0.97
Magnesium sulphate	2.04
Magnesium chloride	3.51
Insolubles	0.43
Moisture	13.27

The quality of sea salt produced on the West Coast is very superior and the results of some of the samples from different factories are given below:—

*(b) SAURASHTRA AND KUTCH FACTORIES**Bhavnagar Salt and Industrial Works, Ltd., Bhavnagar, (Saurashtra).*

Sodium chloride	98.13
Calcium sulphate	0.22
Magnesium sulphate	0.59
Magnesium chloride	1.00
Insolubles	0.06
Moisture	5.21

Bharat Salt and Chemical Industry, Mundra (Kutch)

Sodium chloride	99.00
Calcium sulphate	0.39
Magnesium sulphate	0.32
Magnesium chloride	0.22
Insolubles	0.07
Moisture	2.70

(c) MADRAS SALT FACTORIES

Krishnapatam Platform XII

Sodium chloride	97.25
Calcium sulphate	0.75
Magnesium sulphate	0.97
Magnesium chloride	0.02
Insolubles	1.01
Moisture	11.91

Balacheruvu Platform I

Sodium chloride	97.18
Calcium sulphate	0.48
Magnesium sulphate	1.19
Magnesium chloride	0.01
Insolubles	0.12
Undetermined	0.02
Moisture	11.4

Levingipuram Salt Factory

Sodium chloride	93.80
Calcium sulphate	0.76
Magnesium sulphate	2.20
Magnesium chloride	2.31
Insolubles	0.93
Moisture	9.29

Cuddalore-Platform II

Sodium chloride	94.28
Calcium sulphate	1.22
Magnesium sulphate	1.18
Magnesium chloride	2.16
Insolubles	1.16
Moisture	15.56

Urani Factory-Platform I

Sodium chloride	93.46
Calcium sulphate	0.66
Magnesium sulphate	2.03
Magnesium chloride	3.22
Insolubles	0.63
Moisture	12.69

(d) ORISSA SALT FACTORIES

Surla Salt Factory (Orissa)

Sodium chloride	.	.	.	.	.	96.94
Calcium sulphate	.	.	.	.	.	0.49
Magnesium sulphate	.	.	.	.	.	0.77
Magnesium chloride	.	.	.	.	.	1.02
Insolubles	.	.	.	.	.	0.78
Moisture	.	.	.	.	.	11.25

Ganjam Salt Factory

Sodium chloride	.	.	.	.	.	96.70
Calcium sulphate	.	.	.	.	.	0.51
Magnesium sulphate	.	.	.	.	.	1.01
Magnesium chloride	.	.	.	.	.	1.23
Insolubles	.	.	.	.	.	0.55
Moisture	.	.	.	.	.	12.88

Sumadi Salt Factory

Sodium chloride	.	.	.	.	.	96.20
Calcium sulphate	.	.	.	.	.	0.66
Magnesium sulphate	.	.	.	.	.	0.87
Magnesium chloride	.	.	.	.	.	1.43
Insolubles	.	.	.	.	.	0.84
Moisture	.	.	.	.	.	10.64

In Bombay a Model Salt Farm is being worked by Government since 1950 to demonstrate the correct methods of manufacturing salt to private manufacturers. The quality of this salt is very high compared to private factories in Bombay, as the following analysis results will show:—

Sodium chloride	.	.	.	.	.	98.00
Calcium sulphate	.	.	.	.	.	0.19
Magnesium sulphate	.	.	.	.	.	0.63
Magnesium chloride	.	.	.	.	.	1.15
Insolubles	.	.	.	.	.	0.03
Moisture	.	.	.	.	.	7.07

II. *Lake Salt*.—The Sambhar Lake brine has no magnesium but only sodium sulphate and carbonate. At Sambhar the following types of salt are produced:—

(a) Kyar Salt; (b) Pan Salt; (c) East Lake Reshta; (d) Kyar Reshta.

The analysis results of these types of salt are given below:—

Composition	Kyar Salt	Pan Salt	East Lake Reshta	Kyar Reshta
Sodium chloride . . .	97.81	96.21	98.78	97.81
Sodium Sulphate . . .	1.06	2.22	0.66	1.43
Sodium Carbonate . . .	0.39	0.33	..	..
Sodium Bicarbonate . .	0.37	0.57	0.36	0.42
Insolubles	0.28	0.43	0.15	0.27
Undetermined	0.09	0.24	0.05	0.07
TOTAL	100.00	100.00	100.00	100.00

The analysis results of Pachbadra salt is given below:—

Sodium chloride	97.32
Sodium sulphate	0.38
Calcium sulphate	0.06
Calcium carbonate	0.18
Magnesium sulphate	0.73
Insolubles	0.42
Undetermined	0.91
TOTAL	100.00

At Didwana two types of salt are extracted, one is for human consumption (standard salt) and the other is sub-standard which is not fit for human consumption owing to the presence of large quantities of Sodium sulphate. This salt is issued for industrial purposes only. Efforts are now being made to have a winter crop when the sodium sulphate gets deposited at the bottom and better quality salt can be obtained. The results of analysis of these two types of salt are given below:—

Composition.	Standard salt	Sub-standard salt
Sodium chloride	94.14	87.51
Sodium sulphate	2.13	9.90
Sodium carbonate	0.13	..
Sodium Bicarbonate	0.42	0.31
Insolubles	2.23	1.35
Undetermined	0.95	0.93
TOTAL	100.00	100.00

III. *Inland (sub-soil) Salt*.—In Saurashtra in addition to marine salt an appreciable quantity of sub-soil (Inland) salt is produced by obtaining brine from wells which are dug every year. At Kharaghoda also, which is a Government salt works, only this type of salt is produced. This salt is large-grained and is known as “Baragara” salt. The results of analysis of this salt produced at Kharaghoda and private salt works in Saurashtra are given below:—

Kharaghoda Salt

Sodium chloride	98.83
Calcium sulphate	0.77
Magnesium sulphate	0.05
Magnesium chloride	0.30
Insolubles	0.05
Moisture	1.18

Saurashtra Inland Salt

Sodium chloride	98.65
Calcium sulphate	0.78
Magnesium sulphate	0.02
Magnesium chloride	0.54
Insolubles	0.01
Moisture	1.18

IV. *Mandi Salt (Rock Salt)*.—The salt excavated from Mandi mines is quite impure and has a greyish colour owing to the presence of impurities. This is issued for the cattle and is also used by the local and adjoining area populace by dissolving in water whereby impurities settle down and the brine is used in households. Salt is mined at Guma and is quarried at Drang. Results of two representative samples from each of these sources are given below:—

Guma Salt

Composition	Sample No. 1	Sample No. 2
Sodium chloride	86.53	77.94
Calcium carbonate	0.53	0.07
Calcium sulphate	0.36	0.88
Magnesium sulphate	0.23	0.19
Magnesium chloride	0.13	0.41
Insolubles	12.16	20.51
Undetermined	0.06	
Moisture	0.78	0.39

Drang Salt

Composition	Sample No. 1	Sample No. 2
Sodium chloride	78.33	77.12
Calcium carbonate	0.78	0.11
Calcium sulphate	0.28	0.78
Magnesium sulphate	0.31	0.20
Sodium sulphate	0.29	..
Magnesium chloride . . . . .	..	0.24
Insolubles	18.93	21.51
Undetermined	1.08	0.04
TOTAL	100.00	100.00
Moisture	0.96	0.45

The variation in the two samples from each source is due to the different types of strata struck, at different points.

In addition to the above two types of rock-salt, at Maigal salt works (near Drang) crystal salt is manufactured from the brine flowing from the springs which previously was going a waste.

Some analysis of Mandi Salt (all the three types) were carried out at Government of India Test House at Alipore (Calcutta). The reports are shown below:—

	Salt from the Drang Salt Mine	Salt from the Guma Salt Mine
	%	%
Moisture	2.35	1.50
<i>Analysis on dried sample</i>		
Matter insoluble in Hydrochloric acid	14.20	11.50
Iron oxide	0.43	0.19
Alumina	1.70	1.32
Lime	4.95	4.30
Magnesia	1.60	2.18
Matter insoluble in water	30.30	21.90
<i>Analysis of water soluble portion (extracted from dried samples)</i>		
Water soluble sulphate calculated as sodium sulphate	0.43	0.95
Water soluble alkalinity calculated as sodium oxide	0.06	0.16
Water soluble calcium compounds calculated as Calcium chloride	1.19	0.83

Water soluble Magnesium salts	Trace	Trace
Water soluble Iron and aluminium salts	Trace	Trace
Water soluble chloride calculated as sodium chloride after making allowance for the chloride in combination with calcium compounds	67.40	75.70
Sodium chloride, by difference	68.02	76.16

Brine from Maigal Salt Mine

Density at 30°	1.081	..
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Parts per thousand, weight by volume

Total dissolved solids	128.1	..
Iron oxide and alumina	Practically nil.	
Lime calculated as calcium chloride	1.20	..
Magnesia calculated as Magnesium chloride	0.20	..
Sulphates calculated as sodium sulphate	1.08	..
Chloride calculated as sodium chloride after making allowance for the chloride in combination with calcium and magnesium compounds	125.00	..
Combined carbon dioxide	0.05	..

Sl. No.	Constituents	White Rock Salt	Drang Salt	Drang Salt	Guma Salt	Brine Salt	Guma Salt
1	Sodium chloride .	93.60	76.05	66.52	80.73	95.36	76.05
2	Potassium Nitrate .	0.54	0.71	0.71	0.71	0.65	0.72
3	Lime	0.46	0.33	0.31	0.44	0.22	0.35
4	Magnesia	0.04	Nil	0.08	0.05	0.12	Nil
5	Sulphuric Acid .	0.57	0.34	0.06	0.38	0.05	0.32
6	Insoluble Impurities	4.04	21.36	31.24	16.10	1.68	21.68
7	Moisture	0.30	1.13	0.90	1.07	1.53	0.56
8	Iron and alumina .	Nil	0.03	0.18	0.05	0.05	0.00
9	Loss	0.45	0.05	Nil	0.47	0.34	0.12

Before attaining self-sufficiency in salt, India used to import large quantities of foreign salt. Analyses of these salts have been given in Chapter No. XV (Foreign Salts in India).

A statement showing the analyses of salts in different countries of the world is given in Appendix No. V.

Samples are drawn and analyses are done in accordance with the procedure laid down by the Indian Standards Institution, details of which are given in Appendix No. III.

CHAPTER XIX

CONSUMPTION OF SALT IN INDIA

The properties and uses of common salt have already been given. In short, it is an indispensable part of both human and animal diet. Natural food-stuffs contain salt. It is essential for cattle and valuable for agriculture as manure, has germicidal properties and is valuable to the farmer, planter and florist alike; is used for fish curing, curing of hides and skins, in the modern industry especially in the Alkali industry for the manufacture of caustic soda, soda ash, hydrochloric acid etc; the use of salt is equally or perhaps more important and finds many important uses in medicine as well as it has direct uses in many diseases. It is said that the advancement of industrial science in a country is gauged by the quality of salt used in industries.

It therefore follows that to form an estimate of the actual annual *per capita* consumption as applicable to different classes of people in different provinces in a large country like India, careful consideration is required of many factors which are usually lost sight of by statisticians;

- (1) There are several independent maritime States where salt is produced for local distribution but correct data of their output are not available.
- (2) Salt is produced in many scattered places all over India from brine and by leaching of saline earth. The correct quantity of such salt is also not available.
- (3) Large stocks at works and at distributing centres are often not taken into account.
- (4) Wastage in handling and transit cannot be accurately determined.
- (5) The quantity of salt used for agricultural and industrial purposes or for cattle or as a preservative cannot be accurately estimated.
- (6) Speculative purchases, based on change of salt tax and shown as "issues", cannot be considered as increased demand.
- (7) The effect of floods, rain and drought are not ascertained.
- (8) Quantities in transit cannot be ascertained.

The *per capita* consumption in India as determined from the Revenue returns of quantities of salt consumed in different areas and their population over a period of 10 years seems to be almost the same and unchanged; it was 12.95 lbs. in 1921-22 and 12.75 lbs. in 1930-31. During the first half of the decade immediately prior to the second World War, consumption of salt of undivided India was about 1.9 million tons (530 lakh maunds) a year; in the latter half of that decade it rose to 2.1 million tons (580 lakh maunds); and to 2.5 million tons (680 lakh maunds) before the partition of the country. The present consumption of the Indian Union is about 2.4 to 2.6 million tons (650 to 700 lakh maunds). The increase is due to gradual industrial expansion and increase in population and presumably higher intake for cattle and agricultural uses. The population of the Indian Union according to 1951 Census is 35.68 crores against 31.48 crores during 1941 Census, showing an increase of 13%. If the growth of India's population continues at this rate and expansion of industries continues steadily, India's total consumption in 15—20 years' time may

rise to about 3 1/4 million tons (950 lakh maunds). As a matter of fact, India's consumption should be much more than at present since *per capita* consumption of India varies between 14-15 lbs. which is very low compared with the U. S. A.'s 206 lbs., U.K.'s 103, and World's 41 lbs. per annum.

Nearly 88% of the total salt used in India is used for human consumption and the rest for industries, fish and leather curing, cattle feed and agriculture. The Salt Experts Committee in their report published in 1950 compared Indian consumption to that in the U. S. A. and gave the following comparative statement:

Uses	U. S. A.		India	
	Total million tons	Per capita lbs.	Total million tons	Per capita lbs.
(a) Domestic—				
(i) Table and other household use	0.63	9.73	2.01	12.86
(ii) Livestock	0.71	10.97		
(b) Agriculture	0.03	0.46		
(c) Fish curing	0.07	1.08	0.02	0.13
(d) Meat packing	0.61	9.42	Nil	Nil
(e) Dairy products, canning and other food processing	0.52	8.04	0.01	0.06
(f) Hides and leather	0.26	4.02	0.07	0.45
(g) Industries (including manufacture of chemicals)	10.49	162.05	0.19	1.22
TOTAL	13.32	205.77	2.30	14.72

Salt consumption in India varies from State to State mainly due to climatic conditions and different type of diet. The estimates of such consumption based on investigations extending over several years before the partition of the country in 1947 were as follows:—

Region	Provinces and States	Population (in '000s)	Quantity of salt consumed (in lakh maunds).	per capita consumption in lbs.
1 North and West	N. W. F. P. & tribal areas, Kashmir, Punjab States, Punjab, Delhi, Sind & Baluchistan.	5,07,61	51	8.8
2 North-Central	U.P. and States, Central India Agency and Gwalior, Rajputana and Ajmer Merwara.	8,17,21	105	10.6
3 South & Central	C.P. & Berar, Hyderabad .	3,72,02	50	11

Region	Provinces and States	Population (in '000s)	Quantity of salt consum- ed (in lakh) maunds.	<i>per capita</i> consumption in lbs.
4 Eastern	Bihar and States, Bengal and States, Assam and States, Orissa and States.	12,15,96	180	12.1
5 Western	Bombay Presidency, Bombay States, Western India States.	3,28,53	51	12.7
6 Southern	Madras, Cochin, Travancore, Mysore and Coorg.	6,48,31	155	19.6
Total of India (undivided) :		38,89,64	596	12.6 (average)

In the coastal areas, the consumption is higher than in inland regions because the people are rice-eating and need more salt. In Bengal, Assam, Orissa etc, the higher consumption is also due to use of fish as a main item of diet. Higher consumption in the coastal areas is also due to moist climate. Salt is also used in large quantities for fish curing in the coastal areas.

After Partition in 1947, there were communal disturbances on an unprecedented scale necessitating exchange of minorities between the two Dominions of India and Pakistan. This involved tremendous strain on the railway traffic. Moreover, during and after the second World War there was scarcity of railway wagons and engine power. Besides this, owing to combination of other adverse circumstances, salt shortages were noticed in various parts of the country. So, on the recommendation of the Patel Committee, which was set up in 1947 the routes of movement of salt with a special eye to the needs of the scarcity areas had to be rationalised, and since 1949 salt traffic by rail is being regulated under the Zonal Scheme. In preparing the programme of movement under this scheme, the requirements of salt of each State have been estimated on the basis of 20 lbs. *per capita* per annum for Madras, Andhra, Travancore-Cochin and Mysore; 12.78 lbs. for Bombay and 14 lbs. for the rest of the country. These generally include requirements of salt for human consumption, cattle industry and agriculture.

The consumption of salt in India has, therefore, been dealt with in two parts: (I) Before Partition and (II) After Partition.

I. Before Partition

A.—BRITISH INDIA

(a) PUNJAB AND DELHI

The normal consumption of the Punjab and Delhi was about 33 lakhs of maunds of which 27-28 lakhs came from the Salt Range Mines at Khewra, Warcha and Kalabagh (now in Pakistan). Sambhar and Didwana sent about 5-6 lakhs to the southern-most districts of the Punjab and Delhi.

Salt from Mandi State Mines was consumed in the adjacent places. The Khewra, Warcha and Kalabagh mines supplied about 17, 6 and $3\frac{1}{2}$ lakh maunds respectively and Sambhar and Didwana about 4 and 1 lakh maunds. The consumption varied between 25 lakh maunds and 33 lakh maunds from 1911-12 to 1941-42. The overall requirements of the Punjab and Delhi during the pre-partition days was 35.6 and 1.2 lakh maunds per annum or 10.3 and 11 lbs. *per capita* respectively.

(b) UNITED PROVINCES (UTTAR PRADESH)

In the chapter on saltpetre it has been said that there were a large number of crude saltpetre works and refineries in the United Provinces wherein salt was educed as by-product. The normal consumption of the United Provinces was about 60 lakh maunds. The supply came mainly from Sambhar, Kharaghoda and Khewra which supplied about 40-42, 9-10, 3-4 lakh maunds respectively. Some salt, about 2-3 lakh maunds also came from Pachbadra and about 4.5 lakh maunds of foreign salt were consumed. Some saltpetre was also consumed. The Northern India Salt Sources supplied about 45-46 lakh maunds. The balance was supplied by Kharaghoda and foreign countries. Foreign salt came from Calcutta westwards and Sambhar salt used to go eastwards till they met at a point near Gorakhpur where the rates of both were almost equal. Imported salt was consumed in the eastern districts of the United Provinces, Gorakhpur and Balia. Fyzabad, Basti and Bahraich were the chief marts for Kharaghoda salt, while Kanpur was the chief distributing centre for Rajputana salt. The average consumption was about 11 lbs. *per head per annum*. The consumption ranged from 50 to 75 lakh maunds per annum during 1911-12 to 1941-42. The intake of this province just before the Partition was 71 lakh maunds or 10.5 lbs. *per capita*.

(c) CENTRAL PROVINCES (NOW MADHYA PRADESH)

The total consumption of the Central Provinces was about 25-26 lakh maunds, the bulk of which, about 16 lakh maunds was supplied by the Bombay sea factories. Kharaghoda was the other important source, supplying about 7-8 lakh maunds. Madras supplied 2 lakh maunds and small quantities also came from Sambhar and Pachbadra. At Nagpur, Yeotmal, Khamgaon and Akola Bombay factories held the field. At Khandwa, Bombay salt and Kharaghoda salt competed while at Raipur Bombay sea salt and Madras sea salt competed. At Saugor, Sambhar salt was supreme, while at Jabalpur, Kharaghoda salt competed with it successfully. The consumption was about 16 lbs. *per head per annum*. The consumption differed from 25 to 30 lakh maunds per annum from 1911-12 to 1941-42. The total consumption just before the Partition was about 25 lakh maunds per annum and the *per capita* consumption was 12 lbs. *per annum*.

(d) RAJPUTANA AND CENTRAL INDIA (RAJASTHAN AND MADHYA BHARAT)

The average consumption was about 24 lakh maunds and Sambhar and Kharaghoda were the main sources of supply supplemented in appreciable quantities by Pachbadra and Didwana; and in small quantities by Bombay sea factories. Sambhar supplied about 14 lakh maunds, Kharaghoda 5 lakh maunds and the other sources all together about 5 lakh maunds. The consumption ranged between 24 and 30 lakh maunds from 1911-12 to 1941-42. This was 31 lakh maunds just before the Partition (1946-47), the *per capita* consumption being 10.3 lbs. *per annum*.

(e) BENGAL

The chapter on Foreign Salts shows that Bengal and the adjoining portions of Bihar, Orissa and Assam mostly consume imported salt. The average annual imports of foreign salt in Bengal were about 5,00,000 tons or about 140 lakh maunds. This quantity, however, did not represent the correct consumption in Bengal as some quantities went to U. P., Bihar, Nepal, Bhutan and Sikkim States. Bengal consumed about 80 lakh maunds till 1921-22 and the consumption of this State just before the Partition was 102 lakh maunds at 14 lbs. *per capita* on a population of about 6 crores.

(f) BIHAR AND ORISSA

The consumption of the old Province of Bihar and Bengal was about 24 lakh maunds in 1901-02 and 35 lakhs in 1909-10. It was practically all foreign salt imported *via* Calcutta. In 1936-37 the annual consumption of Bihar and Orissa was about 55 lakh maunds. Orissa obtained her requirements from the adjacent Madras (Andhra) factories, while Bihar consumed mostly foreign salt, about 40 lakhs. About 9 to 10 lakh maunds came from Madras, and about 4 or 5 lakhs from Khewra. Sambhar also supplied about a lakh of maunds. The imports from Khewra and Sambhar rose to 11 to 12 lakhs of maunds during the first World War when foreign salt could not be had in sufficient quantities. In addition small quantities of saltpetre also were consumed. The normal intake of these provinces was between 50 and 60 lakh maunds during the period 1911-12 to 1941-42 and it rose to about 63 lakh maunds during the period prior to the Partition (1945-46), the *per capita* consumption being 11.5 lbs. *per annum*.

(g) MADRAS

The Madras salt factories in olden days on an average produced about 100 to 120 lakh maunds *per annum* and supplied most of the demand of the Presidency. This was consumed throughout the East coast districts and in the inland districts of Madura and Trichinopoly. In other districts, Bombay salt came in along with Madras salt. In Kurnool, Coimbatore and Nilgiri the consumption of Bombay salt amounted to about one-third of the total demand. Most of the demand of Bellary, Malabar, Anantpur and South Kanara districts was met by Bombay. The total supply from Bombay sources was about 14 lakhs of maunds or about 14-15 per cent of the total consumption of the Madras Presidency. Foreign salt was imported to a very small extent only. The annual consumption was 110-115 lakh maunds and the consumption of salt *per head* of population varied from 13.7 lbs. *per annum* in the North Arcot and Chittoor Districts and 15.3 lbs. in the Ceded Districts to 25.6 lbs. in Nellore district; average being 17-18 lbs. During 1933-34 and 1934-35 it was 17.84 lbs. respectively. The consumption during 1945-46 (just before the Partition) was 120 lakh maunds at the rate of 20 lbs. *per capita*.

(h) BOMBAY

The total yearly consumption of salt in the Bombay Presidency amounted to about 39 lakh maunds of which about 29 lakh maunds was supplied by sea factories and about 8 lakh maunds by the Kharaghoda salt works and about three lakh maunds was imported from Goa. Kharaghoda salt

had a well-defined area of consumption. It did not go further south than Surat. Attempts to introduce it into the Deccan met with no success. In the tract between the Narbada and the Mahi, Baragra salt and sea salt were consumed side by side. North of the Mahi, Baragra salt was the only salt in licit consumption in British territory or in Indian States except in Kathiawar where some of the States had the privilege of manufacturing salt. Salt from Goa was imported for consumption in the British districts of the southern Mahratta country. Small quantities of table salt were also imported. The consumption per head was about 13-14 lbs. per annum. During 1933-34 and 1934-35 the average was 13.01 and 11.73 lbs. respectively. The consumption between 1934-35 and 1939-40 averaged at 42 lakh maunds and just before the Partition it was 51.3 lakh maunds for the Bombay Presidency (including Sind, Bombay and Baroda States) and the *per capita* consumption was 13 lbs.

B.—INDIAN STATES AND FOREIGN POSSESSIONS

(a) NORTHERN INDIA

The chapter on Salt Treaties shows that many States got compensation in kind. Some States were also allowed to manufacture salt for their own consumption.

Kashmir.—The average consumption of salt in Kashmir came to about $3\frac{1}{2}$ lakh maunds which was obtained from the Punjab mines. About 1.79 lakh maunds per annum was issued direct to Kashmir, the balance included in the issues to the Punjab.

Bahawalpur.—Salt consumed came from the Punjab salt mines.

Nepal.—Salt was exported to Nepal free of duty under necessary safeguards. The consumption of the State was about 4 lakh maunds, three lakhs being foreign salt sent through Bihar and the United Provinces and the rest Sambhar salt.

(b) BENGAL

There were no special arrangements for the supply of salt to the Indian States in Bengal; the salt purchased by the inhabitants of the States was all duty-paid.

Salt which had paid duty to the British Government was consumed in the French possessions (Chandernagore).

(c) BOMBAY

The chapter on Salt Treaties shows that some of the States were allowed to manufacture salt in their territories and export by sea. Some States were allowed to manufacture only "ghasia" or inferior quality salt. Some States got salt as compensation under terms of their treaties. Some of the States got their supply from locally manufactured salt, others got Baragra salt from Kharaghoda.

(d) MADRAS

Travancore and Cochin.—The State of Travancore got its supplies of salt (a) from a few small local factories, (b) by importation from Bombay by sea and (c) since 1913 by importation from Madras. Cochin had no

local sources and until 1916 got its entire supply from Bombay. Since that year the State frequently indented on the Madras factories. The requirement of these States about 1945-46 was 18·2 lakh maunds per annum at 20 lbs. *per capita* on the population of 74·93 lakhs.

(e) MYSORE

Mysore State obtained its supplies mainly from Bombay and Madras. Earth salt was also manufactured locally. The requirement of this State was 6·38 lakh maunds in 1911-12, it rose to 7·76 lakh maunds in 1922-23 and to 8·21 lakh maunds in 1928-29. The requirement during the pre-partition year was as high as 17·8 lakh maunds at 20 lbs. *per capita*.

(f) NIZAM'S DOMINION

Salt was made locally to a limited extent in the Nizam's Dominion. Supplies were chiefly obtained from Bombay and Madras. The consumption during 1911-12 was 16 lakh maunds, it rose to 17·67 lakhs in 1931-32 and was 18 lakh maunds in 1939-40. The consumption during the pre-partition year was 22·8 lakh maunds at 11·5 lbs. *per capita*.

C.—INDIA AS A WHOLE

The statement on the next pages shows the normal demand of the various provinces together with their normal sources of supply. It will be seen that the normal demand for India (excluding Burma) was about 510 lakh maunds. Of this about 125 lakh maunds consisted of Madras salt, 90 lakh maunds of Bombay sea salt, 25 Kharaghoda, 80 Rajputana salt sources, 40 Punjab Salt Mines, 20 Karachi, 6 Kohat Mines and 124 lakh maunds imported salt. The last figure was made up of about 100 lakhs imported from Aden and other countries and 24 lakh maunds from Indian States (Okha, Morvi and Porbandar). Aden headed the list of imported salts in Bengal and supplied about 70—80 lakhs or about 50—60 per cent of the total demand. Indian sources, especially Karachi and Okha too were steadily gaining ground in the Bengal market. Bengal and Assam entirely depended on imported salt. There was no danger of shortage such as occurred during the first World War days. Even then the trouble was due to speculation rather than to any serious lack of supplies.

Statement showing the normal consumption of different
(In lakh)

Places	Imported	Madras.	Bombay sea	Khara- godha.	Sam- bhar.	Pach- badra.	Did- wana.
Bengal and Assam	76.0	4.0	5.0	..	..	..	..
Bihar and Orissa	40.0	9.0	..	..	2.0	..	..
Central Provinces	..	3.0	14.0	6.0	1.2	0.5	..
United Provinces	5.0	..	..	8.0	45.0	2.0	..
Rajputana and Central India	..	..	..	4.0	13.0	4.0	1.2
Punjab	..	..	..	..	2.0	..	2.0
N.W. Frontier Province and Afghanistan	..	..	..	..	..	..	..
Kashmir and Jammu	..	..	..	..	..	..	..
Sind	..	..	..	..	..	..	..
Bombay	..	..	30.0	7.50	..	..	..
Travancore and Cochin	..	3.0	6.0	..	..	..	..
Nizam's Dominion	..	5.0	13.5	..	..	..	..
Mysore	..	2.0	6.0	..	..	..	..
Madras	..	95.0	15.0	..	..	..	..
Nepal	3.0	..	..	..	1.5	..	..
Other States	..	..	..	..	1.4	2.0	..
TOTAL	124.0	121.0	89.50	25.50	66.1	8.5	3.2
Maximum issues	154.66	137.59	104.01	33.66	85.09	13.51	7.68
	(1929-30)	(1924-25)	(1924-25)	(1918-19)	(1927-28)	(1930-31)	(1922-23)
Maximum production	162.46	166.20	133.70	49.44	111.90	15.01	7.49
	(1929-30)	(1918-19)	(1918-19)	(1920-21)	(1918-19)	(1929-30)	(1922-23)
Minimum production	83.79	81.50	79.19	12.64	12.30	Nil	•58
	(1917-18)	(1914-15)	(1921-22)	(1926-27)	(1911-12)	(1927-28)	(1925-26)

Khewra	War- cha	Kala- bagh	Kohat	Mauri- pur	Saran and Dilyar	Mandi	Goa	Salt- petre	Total
1	..	..	..	18.0	..	..	..	..	103.1
7.0	..	..	..	..	..	..	..	0.2	58.20
..	..	..	..	..	..	..	..	..	24.7
2.0	..	..	..	..	..	..	..	0.3	62.3
..	..	..	..	..	..	..	..	..	22.2
17.0	7.0	3.0	..	..	..	1.2	..	..	32.2
3.0	..	..	5.2	..	..	..	..	..	8.2
1.5	..	..	..	..	..	..	..	..	1.5
..	..	.4	..	4.0	.5	..	..	..	4.9
..	..	..	..	..	..	..	2.30	..	39.80
..	..	..	..	..	..	..	..	..	9.0
..	..	..	..	..	..	..	..	..	18.5
..	..	..	..	..	..	..	..	..	8.0
..	..	..	..	..	..	..	..	..	110.0
..	..	..	..	..	..	..	..	..	4.5
..	..	..	..	..	..	..	..	..	3.4
30.6	7.0	3.4	5.2	22.0	0.5	1.2	2.3	0.5	510.5
43.62	12.62	4.27	7.14	..	3.49	1.46	5.53	1.25	
(1918-19)	(1924-25)	(1928-29)	(1916-17)	(1934-35)	(1917-18)	(1920-21)	(1915-16)	(1916-17)	
41.90	12.50	4.32	7.54	26.69	5.64	1.46	5.53	1.25	
(1918-19)	(1924-25)	(1928-29)	(1916-17)	(1934-35)	(1918-19)	(1920-21)	(1915-16)	(1916-17)	
13.28	1.02	.96	3.98	1.91	.03	.77	2.25	.42	
(1923-24)	(1902-03)	(1923-24)	(1921-22)	(1911-12)	(1920-21)	(1914-15)	(1918-19)	(1923-24)	

II. After Partition

(a) PUNJAB

The present (1951) population of the Punjab is 126.41 lakhs and at 14 lbs. *per capita* the total requirement works out to 21.58 lakh maunds of salt per annum. Previously Punjab used to consume large quantities of Khewra rock salt. Since the suspension of imports of rock salt from Pakistan in October, 1950, the State gets her supply mainly from Sambhar.

The following table shows the consumption and the chief sources of supply:—

Year	Supply from				Total
	Sambhar	Pachbadra	Didwana	Mandi	
1947-48	10.7 (a)	1.2	1.7 (a)	(b)	13.6
1948-49	9.8 (a)	3.1	0.8 (a)	(b)	13.7
1949-50	10.29	6.4	2.27	(b)	18.60
1950-51	7.57	5.41	2.13	0.54	15.65
1951-52	12.64	2.12	2.17	0.51	17.44
1952-53	14.24	0.56	2.22	0.37	17.39
1953-54	11.02	2.00	2.04	0.41	13.49
1954-55	12.04	2.53	1.58	0.28	16.43
1955-56	10.53	1.14	2.07	0.21	13.95

NOTE:—(a) Including supply to Delhi.

(b) Figures not available.

The above statistics do not include rock salt consumed in the State during 1947-48, 1948-49 and 1949-50 when import of rock salt from Pakistan was free. The supplies from Sambhar also include supplies made to (Shree Gopal Paper Mills) at Jagadhri.

(b) DELHI

The population of Delhi according to 1951 Census is 17.44 lakhs and at 14 lbs. *per capita*, the total requirement works out to 2.98 lakh maunds per annum. Prior to suspension of import of rock salt from Pakistan, large quantities of such salt were consumed in this State.

The following table shows the consumption and chief sources of supply:—

Year	Supply from					Total
	Sambhar	Didwana	Khara-ghoda	Bombay	Dhram-gadhra	
1947-48	(a)	(a)	..	..	..	(a)
1948-49	(a)	(a)	..	..	..	(a)
1949-50	3.24	0.12	..	..	..	3.36
1950-51	3.76	..	..	..	..	3.76
1951-52	4.20	0.28	0.77	..	..	5.25
1952-53	3.47	0.40	0.11	..	..	3.98
1953-54	5.99	0.30	..	0.02	0.05	6.36
1954-55	5.76	0.40	0.03	..	..	6.19
1955-56	6.69	0.55	0.01	0.02	..	7.27

NOTE:—(a) included in the Punjab.

The above statistics do not include rock salt imported into the State in 1947-48, 1948-49 and 1949-50 when import from Pakistan was free.

The supply from Sambhar includes supplies to D. C. M. Chemical Works for caustic soda industry.

(c) UTTAR PRADESH

The present (1951) population of Uttar Pradesh is 632·16 lakhs and at 14 lbs. *per capita* the total requirement works out to 107·93 lakh maunds per annum. Previously the State used to consume fairly large quantities of Khewra rock salt.

The following table shows the consumption and chief sources of supply:—

(In lakh maunds)

Year	Supply from									Total
	Sam- bhar	Pach- badra	Did- wana	Kha- ragho- da	Dhra- nga- dhra	Bom- bay	Cal- cutta	Mad- ras	Saura- shtra and Kutch mari- time sour- ces	
1947-48	64.76	4.42	2.50	..	Not avail- able	0.33	3.35	..	..	75.36
1948-49	38.30	4.33	6.86	1.43	Do.	1.11	17.37	0.01	..	69.41
1949-50	41.85	26.53	2.41	8.84	0.82	..	9.24	..	..	89.69
1950-51	39.73	3.38	3.08	12.36	11.00	0.56	5.19	..	..	75.30
1951-52	37.00	3.22	5.66	23.95	8.08	1.73	11.76	..	..	91.40
1952-53	29.02	0.05	3.33	27.49	8.98	1.29	5.84	..	2.08	78.08
1953-54	22.72	..	3.63	38.73	17.94	0.11	0.61	0.08	3.48	87.30
1954-55	21.94	..	2.67	39.06	9.94	0.06	.01	..	6.96	79.68
1955-56	22.68	..	3.21	40.95	12.85	0.09	..	..	6.76	85.84

The above statistics do not include rock salt imported into the State from Pakistan during 1947-48, 1948-49 and 1949-50 when import of rock salt was free.

(d) MADHYA PRADESH

The present (1951) population of Madhya Pradesh is 212·48 lakhs and at 14 lbs. *per capita* the total requirement works out to 36·27 lakh maunds per annum.

The following table shows the consumption and the sources of supply:—

(In lakh maunds)

Year	Did-wana	Khara-ghoda	Bombay	Dhran-gadhra	Madras	Andhra	Calcutta	Total
1947-48	..	12.42	16.96	..	4.33 (Included in Madras)	..	..	33.71
1948-49	..	8.86	20.57	..	2.26	Do	0.06	31.75
1949-50	0.77	7.36	21.31	..	3.09	"	0.37	32.90
1950-51	..	8.66	23.73	..	2.45	"	..	34.84
1951-52	..	5.92	19.59	0.48	2.55	"	..	28.54
1952-53	..	6.87	24.67	0.92	1.51	"	..	33.97
1953-54	..	9.56	23.51	1.71	0.02	1.53	..	36.33
1954-55	..	8.50	23.14	1.56	0.03	2.15	..	35.38
1955-56	..	10.89	26.02	2.06	0.02	1.80	..	40.79

(e) RAJASTHAN

The present (1951) population of Rajasthan is 152.91 lakhs and at 14 lbs. *per capita*, the total requirement works out to 26.11 lakh maunds per annum.

The following table shows consumption and the sources of supply:—

(In lakh maunds)

Year	Sam-bhar	Pach-badra	Did-wana	Khara-ghoda	Dhran-gadhra	Bombay	West Coast	Total
1947-48	15.38	8.19	2.86	0.22	Not available	0.01	..	26.66
1948-49	9.61	1.78	8.55	0.80	Do.	0.04	..	20.78
1949-50	0.31	17.14	..	2.68	0.45	..	..	20.58
1950-51	4.30	7.47	2.54	1.81	0.16	..	..	16.28
1951-52	9.05	5.38	3.47	2.94	0.30	..	..	21.14
1952-53	8.20	5.42	2.32	1.87	0.26	..	..	18.07
1953-54	6.20	4.76	2.49	1.67	0.25	..	0.01	15.38
1954-55	10.45	7.08	1.53	0.97	0.30	..	0.02	20.35
1955-56	13.49	5.77	1.13	1.40	0.39	..	0.02	22.20

The above statistics do not include rock salt imported into the State from Pakistan during 1947-48, 1948-49 and 1949-50 when imports were free.

(f) MADHYA BHARAT

The present population of Madhya Bharat is 79·54 lakhs, and at 14 lbs. *per capita* the total requirement works out to 13·58 lakh maunds per annum.

The following table shows consumption and the sources of supply:—

(In lakh maunds)

Year	Sam- bhar	Did- wana	Pach- badra	Khara- ghoda	Bombay	Dhran- gadhra	Total
1947-48	2·33	..	..	11·18	0·10	Not avail- able	13·61
1948-49	2·78	..	..	9·14	0·22	Do.	12·14
1949-50	6·08	2·25	..	6·19	0·01	4·31	18·84
1950-51	2·51	0·01	0·22	5·07	0·01	3·74	11·56
1951-52	3·29	0·01	..	4·74	0·14	3·90	12·08
1952-53	1·59	..	..	6·73	0·22	2·71	11·25
1953-54	1·30	..	..	7·39	0·32	5·01	14·02
1954-55	0·78	..	..	6·87	0·23	4·13	12·01
	1·00	..	..	7·55	0·21	7·88	16·64

(g) WEST BENGAL

Calcutta is one of the most important salt distributing centres in the country though production is negligible. The Calcutta market depends entirely on salt imported from outside the State. The main imports prior to 1951-52 were from abroad. The bulk of the present imports into Calcutta is from the West-Coast (Saurashtra and Kutch) and the rest from Madras. The Calcutta market supplies salt to West Bengal, Assam, portions of Bihar, Manipur, Tripura, Nepal, Sikkim, etc. The present (1951) population of West Bengal is 248·10 lakhs and at 14 lbs. *per capita*, the requirement works out to 42·36 lakh maunds. Orissa which used to import large quantities of salt from Calcutta in the past has been completely cut out under the Zonal Scheme from 1950 in order to afford facilities to Orissa salt industry to develop. Similarly U. P. districts which used to get salt from Calcutta in the past are now getting their supplies direct from Kandla by rail route since 1953 instead of by sea-cum-rail route.

The following table shows imports of salt into Calcutta from foreign countries and indigenous sources by sea, consumption of West Bengal and exports from West Bengal by inland route.

(In lakh maunds)

Year	Imports into Calcutta by sea from:				Consumption in West Bengal				Exports by inland route.			
	Foreign countries.	(West Coast Saurashtra, Kutch and Mithapur)	Madras	Total	Calcutta source.	Bombay Dhran-Sambhar gadra	Total	Within the country out-side West Bengal	To Nepal	To East Pakistan.		
1	2	3	4	5	6	7	8	9	10	11	12	13
1947-48	111.96	25.56	2.01	139.53	31.64(a)	0.97	..	..	32.61	57.83 (b)	(c)	(c)
1948-49	72.90	72.63	1.11	146.64	53.50	..	..	..	53.50	65.47	1.97	13.40
1949-50	61.01	93.22	11.60	165.83	65.80(d)	0.11	..	..	65.91	68.83	3.10	22.50
1950-51	37.24	103.71	19.34	160.29	50.74	..	..	0.50	51.24	75.28	3.57	23.72
1951-52	..	109.35	21.57	130.92	48.43	0.26	..	..	48.69	71.55	4.21	6.10
1952-53	..	106.22	26.86	133.08	49.86	0.63	0.01	0.14	50.64	78.82	1.00	2.44
1953-54	..	93.88	20.94	114.74	51.13	0.71	0.03	..	51.87	69.18	2.54	2.50
1954-55	..	97.74	27.68	125.42	50.33	0.87	..	..	51.20	66.22	2.24	..
1955-56	..	109.92	23.32	133.24	63.35	0.62	..	0.32	64.29	72.36	3.38	..

(a) By rail only; figures of movements by road and river were not available.

(b) Figures incomplete; complete figures of movements by road and river were not available.

(c) Figures not available.

(d) Owing to influx of population from East Pakistan, the consumption shot up abruptly, which came to normal in 1950-51.

(h) BIHAR

The present (1951) population of Bihar is 402.26 lakhs and at 14 lbs. *per capita*, the total requirement works out to 68.68 lakh maunds.

The following table shows consumption and the sources of supply:—

(In lakh maunds)

Year	Sam- bhar	Pach- badra	Did- wana	Bom- bay	Khara- ghoda	Mad- ras	Cal- cutta	Dhnan- gadra	West coast	Total
1947-48 . .	12.14	2.13	2.78	3.21	3.48	5.47	11.34 (a)	(b)	..	40.55
1948-49 . .	9.54	0.39	1.41	3.23	0.05	0.85	31.16 (a)	(b)	..	46.63
1949-50 . .	19.13	0.64	2.10	0.53	2.26	1.15	38.15	(b)	..	63.96
1950-51 . .	13.39	2.37	7.18	1.16	3.13	2.07	44.73	0.47	..	74.50
1951-52 . .	8.72	1.25	4.01	1.58	4.48	0.42	43.92	5.77	..	70.15
1952-53 . .	3.05	2.41	0.01	8.89	3.27	0.85	53.69	5.36	..	77.53
1953-54 . .	3.75	0.07	..	12.11	1.52	3.48	49.52	5.73	0.58	76.69
1954-55 . .	5.75	..	..	16.66	0.76	3.37	45.37	4.57	7.71	82.19
1955-56 . .	4.50	..	0.06	16.60	1.05	2.66	46.85	3.61	13.54	88.87

NOTE:—(a) incomplete figures; figures of movements by road and river were not available.

The above statistics do not include import of rock salt from Pakistan during 1947-48, 1948-49 and 1949-50 when such imports were free. Considerably high consumption from 1950-51 has been mainly due to unauthorised movements to Nepal, East Pakistan, etc.

(i) ORISSA

The present (1951) population of Orissa is 146.46 lakhs and at the rate of 14 lbs. *per capita*, the requirement of the State works out to 25 lakh maunds. The total production of the State generally varies between 9-10 lakh maunds. So the local salt is not sufficient to meet the demand of this State. The deficit is made up by imports mainly from Madras. Previously salt was imported into the State from Calcutta. This has been stopped under the Zonal Scheme from 1950 in order to afford facilities to the salt manufacturers in this State to develop their industry.

The following table shows consumption and the sources of supply:—

(In lakh maunds)

Year	Orissa	Calcutta	Madras	Bombay	Andhra	Total
1947-48 . .	10.07	0.21	15.00	0.09	..	25.37
1948-49 . .	6.16	2.30	8.49	0.24	..	17.19
1949-50 . .	7.42	5.82	10.29	1.09	..	24.62
1950-51 . .	9.69	0.11	10.67	0.70	..	21.17
1951-52 . .	9.85	..	9.93	1.24	..	21.02
1952-53 . .	8.07	..	10.90	1.85	..	20.82
1953-54 . .	10.61	0.39	0.99	1.73	13.12	26.84
1954-55 . .	9.24	0.07	0.11	2.42	12.18	24.02
1955-56 . .	10.57	..	2.51	3.86	8.43	25.37

NOTE:—Andhra State came into being in 1953-54.

(j) MADRAS

The Madras salt factories (including the present Andhra State which was formed in 1953-54) produce about 175 lakh maunds of salt per annum on an average. Salt produced in this State meets most of the demand of the State. Some areas in the Malabar Coast and the districts of Kurnool, Bellary etc. which are contiguous to Bombay State consume salt produced in this State to some extent. The surplus salt of Madras goes to Calcutta by sea and to Mysore, Hyderabad, Travancore-Cochin; Madhya Pradesh etc. by inland route.

The present (1951) population of Madras (including Andhra State) is 570·16 lakhs and at the rate of 20 lbs. *per capita* the total requirement of the State works out to 139·06 lakh maunds.

The following table shows consumption of the State and the sources of supply :—

Year	Total consumption	Sources of supply		
		Madras (including Andhra)	Bombay	Orissa
1947-48	152·73	148·37	4·36	Not available
1948-49	155·24	143·22	12·02	Do
1949-50	134·66	123·62	11·04	Do
1950-51	134·80	115·78	18·42	0·60
1951-52	133·23	114·80	17·82	0·61
1952-53	129·87	110·60	19·00	0·27
1953-54	91·67	74·64 (Madras)	17·03	0·53
	29·54	28·43 (Andhra)	0·58	0·53
1954-55	90·56	74·51	15·59	0·46
1955-56	82·12	68·44	13·14	0·54

(k) BOMBAY

The total salt production of Bombay State including Kharaghoda and Tata Chemicals in Amreli district is about 225 lakh maunds per annum on an average. After meeting the demand of the State including requirements of the Tata Chemical Industries for manufacture of caustic soda, soda ash and other chemicals, the surplus salt goes to Hyderabad, Mysore, U. P., Bihar, Madras, etc. The present (1951) population of Bombay State is 359·56 lakhs and at 12·78 lbs. *per capita* the requirement works out to 55·6 lakh maunds per annum. Besides, 20—25 lakh maunds per annum are required for manufacture of heavy chemicals at Mithapur.

The following table shows consumption of the State and the sources of supply:—

Year	Total consumption	Sources of supply			
		Bombay Sea Salt	Khara-godha inland salt	Madras	Dhran-gadhra.
1947-48	55.70	39.00	14.44	2.26	Not available
1948-49	52.95	40.87	12.08	..	Do
1949-50	52.22	39.35	11.55	..	1.32
1950-51	54.25 18.54 (I)	38.89 18.54 (I)	14.53	..	0.83
1951-52	48.18 19.88 (I)	36.43 19.88 (I)	11.19	..	0.56
1952-53	52.70 19.68 (I)	40.99 19.68 (I)	11.54	..	0.18
1953-54	54.58 23.58 (I)	40.42 23.58 (I)	13.05	..	1.11

NOTE:—(I) For heavy chemical industry at Mithapur.

(I) JAMMU AND KASHMIR

After the Partition owing to political unrest in the State there was no census of population in 1951. According to the demand made by the State Government the requirement of the State is about 5.3 lakh maunds per annum. Previously the State used to consume rock salt from Khewra Mines. Now the State consumes salt supplied from Sambhar Lake and Kharaghoda and a small quantity of rock salt from Mandi Mines. The supplies from Sambhar and Kharaghoda are being made on Government to Government basis.

The following table shows consumption and the sources of supply:—
(In lakh maunds)

Year	Sambhar	Khara-godha	Mandi Mines	Total
1947-48	..	..	Not available	4.72
1948-49	3.13	1.59	Do.	4.72
1949-50	0.94	2.56	Do.	3.50
1950-51	0.50	3.29	0.05	3.84
1951-52	0.63	4.60	0.04	5.27
1952-53	0.39	4.81	0.12	5.32
1953-54	1.15	3.99	0.07	5.21
1954-55	1.15	4.57	0.10	5.82
1955-56	1.28	5.21	0.41	6.90

(m) TRAVANCORE-COCHIN

The present average salt production in the State is about 16 to 17 lakh maunds per annum against the States total requirement of 22.63 lakh maunds per annum on the population of 92.80 lakhs (1951) at 20 lbs. *per capita*. Prior to the integration of the States (April 1950) owing to the enforcement of import regulations under the Travancore Salt Act, there was restriction over imports into the State from outside sources, and the State used to meet the demand somehow from the local salt. Since Integration, the above Act is no longer applicable. At present the deficit is met from Madras and Bombay. In spite of the deficit in production the State Government want that supplies from outside sources should be restricted as far as possible and confined to Cochin area only so that their local salt industry may develop.

The following table shows consumption of the State and the sources of supply:—

Year	Travan- core- Cochin	Madras	Bombay Sea salt	Total
1947-48	..	0.05	Figures not available	..
1948-49	..	0.01	Do.	..
1949-50	..	0.04	Do.	..
1950-51	19.76	1.04	0.03	20.83
1951-52	13.95	2.71	0.30	16.96
1952-53	13.35	3.95	0.48	17.78
1953-54	15.04	4.41	0.57	20.02
1954-55	16.98	2.73	0.37	20.08
1955-56	17.73	1.95	0.16	19.84

(n) MYSORE

The present (1951) population of the State is 90.75 lakhs and at 14 lbs. *per capita* the requirement of the State is 15.49 lakh maunds per annum.

The following table shows consumption and the sources of supply:—

(In lakh maunds)

Year	Madras	Bombay (Sea salt)	Total
1947-48	14.74	3.26	18.00
1948-49	2.67	3.96	6.63
1949-50	7.85	1.54	9.39
1950-51	7.71	2.64	10.35
1951-52	5.51	2.56	7.71
1952-53	6.96	3.38	10.34
1953-54	7.20	2.82	10.02
1954-55	7.07	4.60	11.67
1955-56	8.03	4.15	12.18

Besides supplies from the sources direct, large quantities of salt go to the State for consumption from the adjoining districts of Madras and Bombay.

(o) HYDERABAD

The present (1951) population of the State is 186.55 lakhs and at 14 lbs. *per capita* the requirement of the State is 31.85 lakh maunds per annum.

The following table shows consumption and the sources of supply:—

(In lakh maunds)					
Year	Bombay (Sea salt)	Khara- ghoda	Madras	Andhra	Total
1947-48	13.11	0.23	18.08	(a)	31.42
1948-49	21.80	..	2.83	(a)	24.63
1949-50	17.50	..	5.87	(a)	23.37
1950-51	21.18	..	6.08	(a)	27.26
1951-52	21.06	..	6.17	(a)	27.28
1952-53	22.58	..	7.75	(a)	30.33
1953-54	21.49	..	0.50	6.88	28.87
1954-55	22.85	..	0.37	7.77	30.99
1955-56	23.06	0.01	1.19	9.74	34.00

NOTE:—(a) Included in Madras.

(p) ASSAM, MANIPUR AND TRIPURA

The present (1951) total population of Assam, Manipur and Tripura is 102.61 lakhs and at 14 lbs. *per capita* the requirement of these States is 17.52 lakh maunds per annum. As Assam and Tripura are contiguous to East Pakistan, there is always influx of population from East Pakistan. Taking this factor into consideration, the estimated total requirement works out to 22.55 lakh maunds. These States get their supplies mainly from Calcutta.

The following table shows consumption of these States and the sources of supply:—

(In lakh maunds)					
Year	Calcutta	Bombay Sea salt	Khara- ghoda	Dhira- gadhra	Total
1947-48	11.29 (a)	0.02	..	..	11.31
1948-49	14.58	..	..	..	14.58
1949-50	15.11	..	..	..	15.11
1950-51	24.77	..	..	..	24.77
1951-52	15.60	0.02	..	..	15.62
1952-53	19.08	0.54	..	..	19.62
1953-54	18.53	0.12	0.08	0.06	18.79
1954-55	20.70	0.15	..	..	20.85
1955-56	25.42	1.01	..	..	25.43

NOTE:—(a) These figures relate to supplies by rail only. Figures of movement by river route are not available.

(q) SAURASHTRA AND KUTCH

The salt production in these States is much above their local requirement. The surplus is exported to foreign countries like Japan, East Africa, Nepal etc. and supplied to Calcutta market, Bombay, Madhya Bharat, Uttar Pradesh, Bihar, Rajasthan etc. The present (1951) total population of these States is 47·05 lakhs and at 14 lbs. *per capita* the total requirement works out to 8·03 lakh maunds per annum (excluding requirement for Dhrangadhra Chemical Works for manufacture of caustic soda and other chemicals). These States get their supplies largely from the unlicensed manufacturers besides supplies from the local licensed factories.

The following table shows consumption of these States and the sources of supply:—

Year	Total consumption.	Sources of supply	
		Bombay	Saurashtra and Kutch
1947-48	..	..	Not available
1948-49	..	0·05	Do.
1949-50	..	..	Do
1950-51	4·84 7·52 (I)	..	4·84 7·52 (I)
1951-52	5·13 8·15 (I)	0·01	5·12 8·15 (I)
1952-53	3·31 8·17 (I)	0·02	3·29 8·17 (I)
1953-54	1·77	..	1·77

NOTE:—(I) Supplied to Dhrangadhra Chemical Works.

(r) HIMACHAL PRADESH, PEPSU AND AJMER

Himachal Pradesh and Pepsu States used to consume mostly Khewra salt in the past. After the suspension of imports of the Khewra salt in 1950, these States have been consuming Sambhar salt. The present (1951) population and requirement per annum at 14 lbs. *per capita* of these States are as follows:—

State	Population (in lakhs)	Requirement (in lakh maunds)
1 Himachal Pradesh (including Bilaspur)	11·09	1·90
2 Pepsu	34·94	5·96
3 Ajmer	6·93	1·18

The following table shows consumption and the sources of supply:—

Year	Pepsu				Himachal Pradesh			Ajmer		
	Sam- bhar	Did- wana	Pach- badra	Total	Sam- bhar	Mandi	Total	Sam- bhar	Did- wana	Total
1950-51 . . .	0.36	0.23	..	0.59	0.50	0.86	1.36	0.71	0.01	0.72
1951-52 . . .	2.57	0.43	..	3.00	0.77	0.83	1.60	0.74	0.02	0.76
1952-53 . . .	2.66	0.08	0.22	2.96	0.87	0.92	1.79	0.65	..	9.65
1953-54 . . .	2.16	0.96	..	3.12	0.67	0.88	1.55	0.92	..	0.92
1954-55 . . .	3.53	0.02	0.19	3.74	1.07	0.70	1.77	1.22	0.04	1.26
1955-56 . . .	2.79	0.01	..	2.80	0.85	0.77	1.62	1.08	..	1.20*

* includes 12,000 mds. from Pachbadra.

(s) VINDHYA PRADESH AND BHOPAL

The present (1951) population of these States and requirements per annum at 14 lbs. *per capita* are as follows:—

	Population (lakhs)	Require- ments per annum (lakh maunds)
Vindhya Pradesh	35.75	6.10
Bhopal	8.36	1.43

The statement below shows consumption of these States and the sources of supply:—

(In lakh maunds)

Year	Vindhya Pradesh				Bhopal
	Bombay Sea salt	Khara- ghoda	Dhara- gadhra	Total	Khara- ghoda.
1949-50	0.03	1.93	(a)	2.03	1.59
1950-51	0.25	2.16	3.43	5.84	1.33
1951-52	1.75	2.38	0.02	4.15	1.29
1952-53	1.48	2.03	0.35	3.86	1.32
1953-54	1.63	4.30	0.22	6.15	1.79
1954-55	0.94	3.84	0.01	4.79	1.41
1955-56	1.04	4.46	0.02	5.52	1.92

CHAPTER XX

DISTRIBUTION

The distribution of salt in India is obviously a vast and complex process, for, apart from such general considerations, as distances and difficulty of communications, the sources of supply are irregularly placed. The manufacture of marine salt is mostly concentrated in Madras, Bombay, Saurashtra, Kutch, Orissa and Travancore-Cochin which feed the major part of the country. The inland salt sources are in Rajasthan (Sambhar, Pachbadra and Didwana), Kharaghoda (Bombay), Kuda, Jesda etc. (Little Rann of Kutch in Saurashtra), and Mandi (rock salt in Himachal Pradesh). The production in Bengal is meagre.

Salt is despatched from the producing centres largely by railways. About 15% of the production is despatched by sea from the salt works in Saurashtra and Kutch and to a limited extent from the salt works in Madras to Calcutta for consumption in Bengal, Bihar, Assam, etc. Prior to the second World War salt could be despatched from any producing centre to any place in the country irrespective of the distance, depending upon the demand for a particular quality from the particular works. It was not unusual to find salt produced in Bombay being despatched right into the heart of the Madras Presidency or salt from Kuda going as far as Nepal; similarly salt from Tuticorin used to be sent into Hyderabad when salt from nearest sources like Naupada could have been delivered more quickly and at cheaper cost.

A.—OLD SYSTEM

The system varied from source to source.

I. Government Sector.—(a) Sambhar.—In the beginning (1870) salt was sold to the public from the lake and attempts were made to weigh the entire despatch and traders were allowed to fill their bags. As entire weighment led to great delays, system of 10% weighment was adopted which worked satisfactorily. The Sambhar Lake was connected by rail in 1876, when salt began to be despatched by rail. The system of sales was as follows:—

- (i) The Through Traffic system to facilitate supply of salt to outside public. The system continued till 1916. The Banjara trade also flourished side by side.
- (ii) Sale at Government Depots or through agency of contractors existed for some time, but it was also abolished.
- (iii) After the first World War, profiteering in salt increased considerably. So, the Agency System was introduced in 1920-21. In consultation with the District Officers, reliable agents were appointed in each district and were permitted to indent for salt on the condition that they would sell it wholesale at a fixed price. The system was abolished in 1924.
- (iv) Open indenting system was then introduced. A trader had to submit an application at authorised treasuries, sub-treasuries or Post Offices which were notified by the Commissioner. The traders were required to deposit price of salt, duty and all other charges in connection with bagging, weighment, loading and despatching charges of the salt. They were required to supply their own bags.

- (v) The above system continued till 1928-29 when one or two big firms assisted by the credit system put in heavy indents and tried to monopolise the trade. So, the system of allotment of wagons on *pro-rata* basis was devised. The system was, however, abolished in May, 1933.
- (vi) Free indenting rules were again introduced from 1st May, 1933, and continued up to 1939.
- (vii) With the outbreak of the World War II in September, 1939, profiteering and speculation by unscrupulous traders again reappeared as during the first World War. So, it was decided in early 1940 to eliminate the speculators and allow only the genuine traders to indent for salt. Only the traders who indented for salt during the pre-war days were permitted to indent. Two lists—one for the local traders and the other for the outside traders were prepared and their names sent to the treasuries. The General Manager used to select traders out of these lists by lottery and only they were allowed to place indents and the Treasuries were advised accordingly. New traders were also permitted to apply for registration of their names and about three thousand names were registered in September, 1941. It was found that there were one thousand bogus firms amongst the new traders. Their names were deleted. Due to allegations and counter-allegations, fresh applications were invited in early 1942, and it was decided that the traders in British India should send their applications through the District Magistrate concerned and through the Executive Officer, Shamlat area, Sambhar in the case of Sambhar.

(b) *Pachbadra*.—

- (i) Formerly there was the usual free indenting system.
- (ii) *pro-rata* system of allotment was introduced in 1929-30 but it was discontinued in 1936-37.
- (iii) Annual allotment system and Free-indenting system were then introduced. Under the former system, the traders were invited to apply for not less than 1,50,000 maunds of salt to be cleared during an official year. As regards the other system, applications were received and dealt with by the Superintendent in charge, in the same way as at Sambhar.

(c) *Didwana*.—Formerly treasureis at Hissar, Rohtak, Bikaner and Sambhar were authorised to accept revenue for Didwana salt. Traders were required to take delivery of their salt from the heap and to make their own arrangements to carry the same to Balia Railway Station, 1½ miles away from Didwana.

(d) *Kharaghoda*.—Almost the entire quantity of salt consumed within the Bombay Presidency was issued through agencies, as the retail dealers found it cheaper to buy salt from the agencies than by indents from Kharaghoda. The agents used to supply bags to those purchasers who could not supply their own according to market price of the bag. Government began to produce salt at Kharaghoda in about 1872-73 in order to provide cheap salt to the public in North Gujarat, Marwar and Rajputana. The procedure of supply was generally as follows:—

- (i) Salt was delivered at 'uniform' price at any station in Gujarat through depots established at important railway stations.

(ii) The 'uniform' rate was done away with and actual railway freight was added to ex-works price, duty and other charges, if any.

(iii) Trade was thrown open to all persons who chose to indent for salt on payment of duty, cost price etc. in any Government Treasury. They were also allowed to deposit money at selected railway stations to afford them further facilities. Majority of the up-country traders, however, used to place indents on commission basis through two/three leading salt merchants of Ahmedabad who advanced money for duty, cost price, cost of gunny bags, etc. Taking advantage of this, whenever there was shortfall of production at Sambhar, the Sambhar traders used to indent Kharaghoda salt freely causing serious depletion of stocks. Government then decided to build reserve stocks at Kharaghoda equivalent to three years issues to meet such contingency.

(iv) During the first World War, unscrupulous merchants used to fill in indents for Kharaghoda salt and then sell at huge profits. In 1920, it so happened that in a single day, indents equal to three years' production at Kharaghoda were filled by merchants speculating in salt. After the war, as salt in large quantities was coming from outside, such traders found it difficult to dispose of their salt and they had to take refund. Since then the outside traders ceased to deal at Kharaghoda and the merchants of Ahmedabad and surrounding districts of Bombay only were in the trade.

(v) After the outbreak of the 2nd World War in 1939, previous history repeated and the traders started placing indents for bulk of the stock in advance for the purpose of speculation. The Government had, therefore, to issue "Kharaghoda Salt Indenting Rules, 1942". Under these Rules, the genuine dealers registered by the Collector of Central Excise, Bombay, had only been allowed to place indents for salt.

II. *Private Sector*.—Since the salt factories were owned by private individuals the purchaser had to make their own bargains with the manufacturers without the interference of Government, excepting that no salt was allowed to be cleared from a factory, until the duty on salt was paid in advance.

The system of distribution prevalent during the war period and since the cessation of the war is described below. As the system of distribution from Government salt sources and private sources has differed throughout, the two systems have been described separately.

B.—PRESENT SYSTEM

I. *Government Sector*—(a) *Up to 1941*.—Government sources produce one-fourth of our total salt production, or about 200 lakh maunds annually. During peace time, distribution was done through normal trade channels. Any one could indent for salt on any Government source, but most of the indents used to be placed by the local dealers at Sambhar, Kharaghoda, etc., who sold the Railway Receipts to mofussil traders at a small profit. Owing to competition and free transport, the profit on a wagon costing (in duty days) about Rs. 500 were kept down to only Rs. 5 to Rs. 10. Some mofussil traders, who could afford to lock up their money for a month or two, also indented direct from the source concerned.

(b) *1941–1950*.—This system, however, broke down in 1941, due to abnormal conditions, and speculators deposited lakhs of rupees as revenue and pushed up prices to exorbitant figures when their indents

began to clear. The Salt (Emergency Distribution) Order, 1942, was accordingly issued under the Defence of India Rules and half the production from Government sources was given to district nominees selected by District Magistrates, only the other half being kept open for private trade. Also, to stop speculators from putting in indents, "genuine" traders were registered on the basis of their previous standing in the salt trade and they alone were allowed to indent along with the district nominees. This system continued till 28th April, 1950. The Registered traders at Sambhar and Kharaghoda were bound to sell all their wagons to the district nominees on a commission of Re. 0/1/0 a maund. This system worked satisfactorily for some time.

SALT (EMERGENCY AND DISTRIBUTION) ORDER, 1942

The Government of India in order to regulate distribution of salt from the Government sources issued the following Order in 1942 under the Defence of India Rules:

"FINANCE DEPARTMENT (CENTRAL REVENUES)

NOTIFICATION

SALT

Simla, the 24th October, 1942

No. 16.—In exercise of the powers conferred by sub-rule (2) of rule 81 of the Defence of India Rules, the Central Government is pleased to make the following Order, namely:—

1. (1) This order may be called the Salt (Emergency Distribution) Order, 1942.

(2) It shall come into force at once.

2. In this Order 'the Collector' means—

(1) in the Province of Bombay, the Collector of Salt Revenue, Bombay, and

(2) within the territorial limits of his jurisdiction as defined under section 5 of the Indian Salt Act, 1882, the Collector, Central Excises and Salt, North Western India.

3. Notwithstanding anything contained in any rule of procedure or in any contract entered into by or on behalf of the Central Government, the Collector or any Salt Revenue Officer authorised by him in this behalf, may in issuing salt from a Government manufactory,—

(a) give priority to such extent as he thinks fit to the indents of any person or body of persons or society nominated by a District Officer or by the Administration of an Indian State or of a Municipal Committee or other local authority, or of a registered co-operative society;

(b) direct any other indenter to send the whole or any portion of the salt issued to him to such destination or destinations as may be specified in the direction.

4. If any indenter fails to comply with any direction given to him under sub-clause (b) of clause 3 he shall be deemed to have contravened the provisions of this Order; and without prejudice to any other action that

may be taken against him in respect of such contravention, the Collector may cancel any or all his indents which may be outstanding and refuse to accept any further indents made by him or on his behalf.

(Sd.) J. F. SHEEHY,

Additional Secretary to the Government of India.

POLITICAL DEPARTMENT

NOTIFICATION

New Delhi, the 26th October, 1942

No. 411-1-B.—In exercise of the powers conferred by the Indian (Foreign Jurisdiction) Order in Council, 1902, and of all other powers enabling him in that behalf, and in pursuance of the agreement made with the Ruler of the State of Jaipur, dated the 7th August, 1869, and of the agreements made with the Ruler of the State of Jodhpur, dated respectively, the 27th of January, 1870; the 18th of April, 1870 and the 18th of January, 1879; which provide for the lease to the British Government of the salt sources of Sambhar, Didwana and Pachbadra within the said States, His Excellency the Crown Representative is pleased to direct that the Salt (Emergency Distribution) Order, 1942 [made by the Central Government under sub-rule (2) of rule 81 of the Defence of India Rules] shall apply in relation to the issue of salt from the said sources, as it applies in relation to the issue of salt from a Government manufactory within the jurisdiction of the Collector of Central Excises and Salt, North Western India.

(Sd.) K. S. FITZE,

Secretary to His Excellency the Crown Representative."

The above Order checked the activity of illegal trade of the dealers at the Government sources to some extent. In 1943, the Collector of Central Excise concerned, put a further check on them by asking them to form themselves into Associations of genuine traders registered by the Department. In accordance with this Order, 4 limited companies were formed at Sambhar and these companies were allowed to indent for the wagons and despatch them to the district nominees at the destination on a commission of Re. 0/1/6 per maund without having any hand in the disposal of the wagons at the destinations. The traders were classified by the Collector *ad hoc* into three separate categories A, B and C, giving 5, 3 and 1 units respectively for the purpose of delivering the percentage of allotment of the total number of wagons to be given to the individual companies. The classification was not based on the volume of business done by each firm but it was according to the period in which they were in the business. Thus, traders who had been indenting Sambhar salt for three years before 1939, were placed in "A" category, those doing trade between 1939 to 1942 were classed as "B" and the rest as "C". The total number of traders in those four companies at that time was about 500.

The Salt (Emergency Distribution) Order was withdrawn in March, 1946, after the cessation of the War and the salt duty was abolished a year later in 1947, when the country was partitioned and attained independence. During this period (1946-47), profiteering activities of these Sambhar Companies reached at the climax. Hon'ble Dr. Rajendra Prasad, the then Minister for Food, Government of India, investigated into such unsocial

activities of the traders personally in August, 1947. These traders openly admitted the charge of black-marketing levelled against them by some traders in Bihar.

After the Partition, 5 more registered limited concerns were allowed to be formed at Sambhar out of the displaced salt traders of West Punjab and Sind. A tenth company was allowed to be formed in 1948 out of the petty brokers and traders, who had lost their means of livelihood on account of the present system of indenting on behalf of the district nominees on a commission basis. After the abolition of duty, the commission was also reduced from Re. 0/1/6 per maund to Re. 0/1/0 per maund on account of smaller capital involved in the indenting of wagons.

In 1948, complaints were received from time to time that there were some spurious firms registered as *bona fide* salt traders by the Department for the purpose of allotment of salt wagons. Some of the registered companies took advantage of these firms in having an inflated quota of wagons to their advantage, although it was alleged that these firms did not exist at all at Sambhar or became defunct. An enquiry had, therefore, to be made. As a result of this enquiry, 164 names were deleted out of the registered list of about 600. Quota of wagons was then redistributed amongst the ten registered companies formed at Sambhar on the revised strength of the genuine traders in each individual company. The only other change made as a result of the above enquiry was to abolish the unitary strength of 5:3:1 for A, B and C class traders respectively, as it was found that the original allotment was not on a rational basis depending on the volume of business. In the absence of any information about the volume of business of the large body of individual traders, who were all free from Income-tax, it was considered equitable to treat all of them alike and to count one unit for each and the quota of each company was determined accordingly. The total number of wagons issued from Sambhar in 1949 was about 2,130 per month and the percentage of the ten different companies was fixed as follows:—

Name of the Company	Percentage of allotment of wagons on the basis of one unit for each member	
	Before 1-9-49	From 1-9-49
1 The Salt Merchants' Association Ltd., Sambhar Lake	29.17	25.29
2 Shri Shakambhar Salt Merchants Association Ltd., Sambhar Lake	29.11	25.48
3 The Shakambhar Salt Traders' Association Ltd., Sambhar Lake	15.24	14.29
4 The Chamber of Sambhar Traders Ltd., Sambhar Lake	10.69	10.42
5 The Salt Suppliers Syndicate Ltd, Sambhar Lake	Ad-hoc 100 wagons	8.69
6 Bharat Salt Syndicate, Sambhar Lake (Formerly of Khewra)	2.74	1.93
7 The National Salt Trading Co. Sambhar Lake (Formerly of Khewra).	3.02	2.12
8 Warcha Registered Salt Traders Association Ltd., Sambhar Lake (Formerly of Warcha).	3.95	4.63
9 Kalabagh Salt Traders' Association Ltd., Sambhar Lake (Formerly of Kalabagh).	2.96	3.48
10 The Sindhi Salt Traders' Association Ltd., Sambhar Lake (Formerly of Sind).	3.12	3.67
TOTAL	100.00	100.00

Thus the five registered companies got about 84% and the five refugee companies got about 16% of the total quota of wagons per month from 1-9-1949. These companies were allowed a fixed commission of Re. 0/1/0 per maund for services rendered by them in arranging despatches of salt to the district nominees on payment of the price of salt and the price of empty bags and other sundry expenses.

At Pachbadra and Didwana also there were similar registered companies as follows:—

At Pachbadra:—

Name of the company	Percentage of quota of wagons
1. Pachbadra Salt Traders' Association Ltd.	31%
2. Luxmi Salt Trading Co.	38%
3. Refugee Salt Syndicate	31%
TOTAL	100%

At Didwana:—

1. Didwana Salt Co. Ltd. (11 firms)—Granted all wagons except meant for Hissar District.
2. Hissar Registered Co. (7 firms)—Wagons for Hissar District.

Kharaghoda:—

Supplies from Kharaghoda were also made through dealers registered by the Salt Department under the Kharaghoda Salt Indenting Rules, 1942. There were 51 registered dealers at Kharaghoda out of whom 29 formed themselves into a private limited company with 307 unit cards and the remaining 22 worked independently with a total of 40 unit cards. The strength of the cards determined the allotment of quota of wagons. This system was the result of experiments tried from time to time by the Central Board of Revenue during 1924 to 1941. Prior to 1942, the distribution was free to the trade and any trader was free to make payment of the duty and price in any treasury and to send the indent with treasury receipt to Kharaghoda for the supply. During the second World War, when import of salt was restricted, there were complaints of hoarding and profiteering by monopolists. At one time, the Central Board of Revenue found that the total quantity of salt for which payment was made into the treasury far exceeded the stock available at Kharaghoda factory. The Central Board of Revenue, therefore, registered these 51 traders in 1942 after satisfying that they paid Income-Tax and after enquiring into the volume of business done by each during the 3 years preceding 1942.

Abolition of the Registered Traders System at Government sources:—

The system of supply of salt to different consuming areas from the Government sources through the Registered salt traders continued from 1942 to 1949. The salt traders at Sambhar, especially the petty traders started agitation and wanted equal opportunities for all registered traders. The question was, therefore, discussed by The Salt Advisory Committee, in their meeting held on 9-4-1950 and it resolved that "the distribution of salt from Sambhar and Kharaghoda should

be made free and the present system of appointing registered dealers by Central Government should be abolished leaving each individual buyer free to make his own arrangement for taking delivery of his salt from salt works, whether direct or through any duly authorised agent". The Government of India accepted the recommendation of the Salt Advisory Committee and ordered that with effect from 28-4-1950 the system of registration of dealers at Sambhar and Kharaghoda by Government for the purpose of allotment of quota of wagons should be abolished leaving the buyers of salt free to buy directly from the factories or to nominate their own agents in writing for taking delivery of the salt from Sambhar and Kharaghoda. The Salt Department accordingly issued instructions by its Memorandum No.-Salt (D)XVIII-2/50, dated 6-5-1950, that where the district nominee system was in force the nominees alone or their authorised agents at Sambhar and Kharaghoda would be allowed to place indents on the factories. Where there was no such system, indents would be accepted from recognised dealers of the districts whose names had been recorded at Sambhar and Kharaghoda as the consignees during the past six months.

II. *Private Sector*—SYSTEM OF DISTRIBUTION FROM PRIVATE FACTORIES (*Bombay, Madras, Saurashtra, Kutch, Travancore-Cochin, Orissa, etc.*)—These sources produce about 600 lakh maunds of salt annually, which is about (three-fourths) of the total salt production in India. This salt feeds Bombay, Mareas, Hyderabad, portions of Madhya Pradesh, Orissa, major portion of Bihar, Bengal, Assam, Travancore-Cochin, Saurashtra, Madhya Bharat, portion of Uttar Pradesh, etc. There is no particular control or any system of sale to specified persons in respect of these sources. Anyone can negotiate with the private manufacturers or their selling agents, if any, and purchase salt. Some States have issued Salt Control Orders under the Essential Supplies (Temporary Powers) Act, 1946 to regulate imports and distribution of salt in their States. In case of such States, the nominees appointed by the State Governments are permitted to import salt; but there is no binding on them from whom such purchases are to be made. They are free to negotiate and settle the price and other terms, whereas in the case of supply from Government works, prices and other charges are fixed.

(a) *Bombay*.—In Bombay, salt is generally marketed by the members of the Bombay Salt Merchants' and Shillotries Association. Salt is transported by manufacturers from their factories to the railhead and made over to the purchasers, who are middlemen and who sell salt to numerous retailers in different areas.

(b) *Madras*.—The system is different in Madras, where a good deal of salt is passed on by the manufacturers to the retailers on a commission basis, so that the manufacturer makes a profit not only from the selling price fixed by Government but also from retail price. Also, the wholesalers in the more distant areas buy the salt outright at the factory and transport it to their provinces. Some quantities are also despatched to Calcutta by sea wherefrom it is supplied to consuming areas by the importers or the State Governments' agents, if any.

(c) *Saurashtra*.—Excepting a small portion of the production for local consumption, major quantities are either exported to Japan (export commenced since 1950), or despatched by sea to Calcutta through importers, wherefrom either these importers or the State Governments' agents distribute the same to consuming areas.

(d) *Orissa and Travancore-Cochin*.—The manufacturers or their selling agents, if any, sell salt to wholesale dealers etc. in the consuming areas.

(e) *Bengal*.—Calcutta is one of the most important salt distributing centres in the country. There is no hard and fast rule in Calcutta in connection with sale and supply of salt; it is according to normal trade practice. Owing to transport difficulty after the second World War, especially after the Partition of the country, black marketing in salt wagons was rampant and there was no check. The Railway authorities, in consultation with the Salt Department, had, therefore, to introduce a system since 1948 that salt wagons would be supplied according to periodical programmes drawn up by the Assistant Salt Commissioner at Calcutta and wagons to be supplied to those salt dealers only who had been registered by the Salt Commissioner for the purpose. Again, the Railways would supply wagons only to those registered dealers who would produce 'stock certificates' from the Salt Department in support that they had ready stocks of salt in bags for despatch. This system has been continuing after the introduction of the Zonal Scheme also. When transport position improved in Calcutta, some relaxation was made that salt dealers who are not registered by the Salt Commissioner can also despatch salt when such movement is not in accordance with the Zonal Scheme, i. e. for 'ordinary' traffic.

Thus at Government sources the supplying agents, if any, and district nominees are the first middlemen after whom come the retailers. In private factories, there are the purchasers (brokers of the Salt Associations), then the wholesalers and then the retailers; while for Saurashtra centres of production, there are salt importers, the wholesalers and the retailers.

C.—SERVICES RENDERED BY WHOLESALERS AND RETAILERS AND PROFITS EARNED BY THEM

Generally, the wholesalers perform the following services:

- (i) indenting for salt,
- (ii) arranging for bags,
- (iii) paying transport charges, handling charges, cartage from Railway station to the godowns,
- (iv) maintaining godowns, and
- (v) selling to retailers a bag or two each.

The retailers sell salt to the consuming public, along with other commodities, in small quantities.

Where there are Price Control Orders issued by the State Governments under the Essential Supplies (Temporary Powers) Act, 1946, different Governments have fixed different rates of profit, but generally they vary from 5 to 10 per cent. The Madras Control Order allows $6\frac{1}{4}\%$ to wholesalers; the Uttar Pradesh Control Order—5% to wholesalers and 10% to retailers; in Delhi, wholesalers get about $7\frac{1}{2}\%$ and the retailers 10% etc.

D.—STATE TRADING IN SALT

In Gujerat, there is a system of supply of salt from Kharaghoda Government factory through some salt depots run by M/s. Nowrojee Pestonjee and Co., who are allowed to indent for Kharaghoda salt. They have their godowns and depots at big stations and run 32 agencies. This system has been functioning well for the last 70 years. They distribute salt in lots of three maunds to retailers on a commission of 9 pies per maund (present rate).

Government wanted to introduce similar system of supply throughout the country. The then Ministry of Works, Production and Supply, Government of India in April, 1951 suggested to the State Governments to take over the distribution work direct, and to appropriate at least part of the profits at present made by the wholesalers. The advantages of the scheme were that the Government would be able to maintain local buffer stocks; and the public would not be at the mercy of the wholesalers who sometimes profiteer unduly. For buffer stocks godowns at important centres would be necessary. It was thought that Government lost about 10-11 crores of rupees by abolition of the salt duty, but the consumer had not been benefited to the same extent, and so some profits which the middlemen had been making could be taken over by the State Governments. It was up to the State Government to consider whether they could take over distribution direct, i.e. whether they should have a Governmental organisation, or whether they should appoint wholesalers for different areas and charge their commission. As the majority of the State Governments did not agree, the proposal was dropped in August, 1951. It was, however, ordered that it should be considered how to improve the existing system with a view to avoid (i) deliberate shortages by the nominees, (ii) secure steadier supply to all areas concerned by revising the Zonal arrangement wherever necessary.

The Planning Commission who also considered this matter invited the views of the Ministry of Industry and Supply. The Planning Commission stated:—

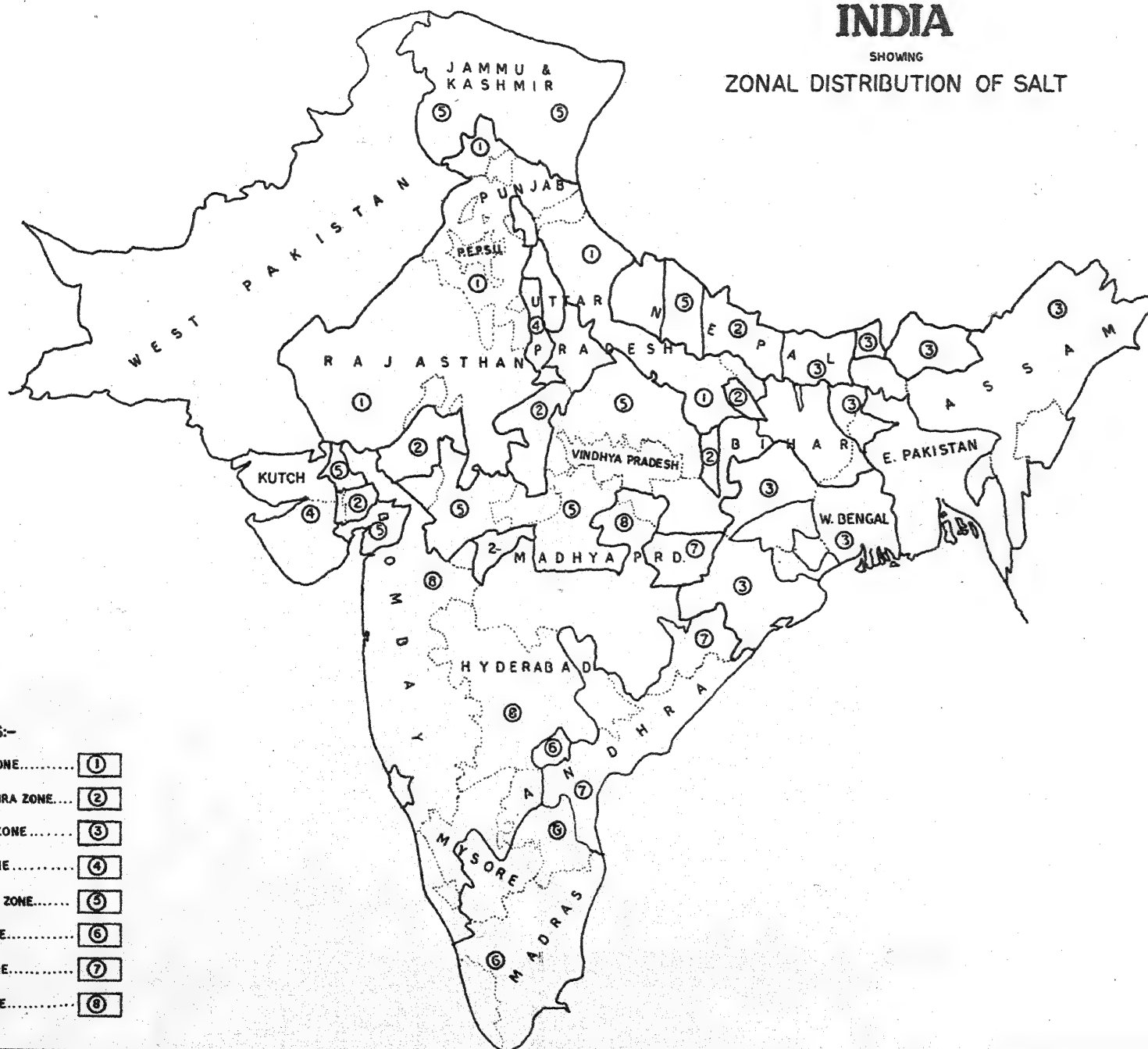
“The Ministry of Industry and Supply stated that the proposals for State trading in the Greenfield Report amounted to no more than the levy of the old salt duty in a different form. ‘It is, no doubt, true’, as pointed out by the Ministry of Industry and Supply, ‘that if all private factories are obliged to sell the production to Government at a fixed price and Government in their turn, sell at a higher price, a considerable income would accrue. But it is necessary to add that even a slight increase in the price of salt, as a result of Government action in order to secure revenue, might create several difficulties. For instance, middlemen acting as distribution agents might raise out of all proportion the price at which salt would be sold to the consumers. Rigorous measures of control might, no doubt, have to bring down the quantum of such unwarranted increase. But experience of the working of controls does not show that it would be possible to prevent middlemen taking advantage of price increase effected by Government. Secondly, increase in the price of salt, however, small would have unfavourable repercussions not only because of Government’s policy to reduce the prices of essential commodities, whenever possible, but also because of the importance given to cheaper salt in the national programme in the past. Since the salt duty was removed in order to cheapen salt, any measure that would result in increase in the price of salt would be subject to serious public criticism.”

E.—NATIONALISATION OF SALT INDUSTRY (MARKETING SIDE) AS A MEANS OF ADDITIONAL REVENUE

The Ministry of Finance (Revenue Division) in early 1954 considered, in collaboration with the Ministry of Production and the Salt Commissioner, the feasibility of nationalisation of marketing or State trading in salt.

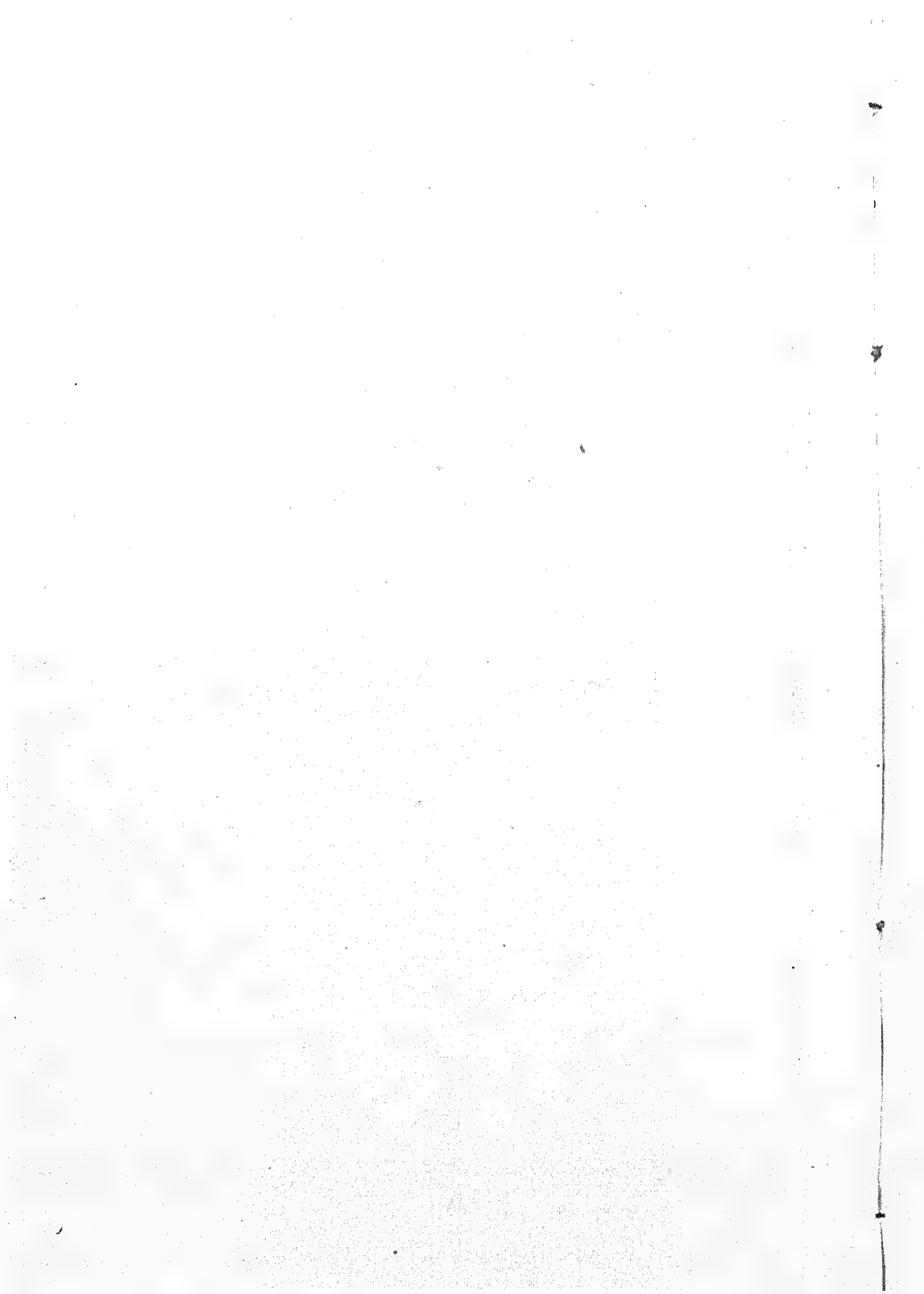
INDIA

SHOWING
ZONAL DISTRIBUTION OF SALT



References:-

- SAMBHAR ZONE..... ①
- DHARANGADHRA ZONE.... ②
- CALCUTTA ZONE..... ③
- W. COAST ZONE..... ④
- KHARAGHODA ZONE..... ⑤
- MADRAS ZONE..... ⑥
- ANDHRA ZONE..... ⑦
- BOMBAY ZONE..... ⑧



As the salt industry in India is spread over thousands of miles over several States and there are thousands of wholesalers and retailers throughout the country scattered in about 7 lakh villages in India and considering other aspects the matter was not pursued further and was dropped.

F.—CONTROL OVER DISTRIBUTION, PRICE, ETC.

Soon after the abolition of duty in April, 1947, the country was partitioned which brought in its wake communal disturbances on an unprecedented scale necessitating exchange of minorities between the two Dominions of India and Pakistan. This involved a great strain on the railway traffic. In addition, owing to combination of adverse circumstances, such as decrease in salt production in West Coast (Saurashtra and Kutch) owing to natural causes, shortage of shipping affecting foreign imports, inadequate railway transport, labour dissatisfaction and suspension of import of rock salt immediately after the partition, shortage of salt was noticed in various parts of the country. The Government of India set up an Inter-departmental Committee in 1947 under the Chairmanship of Shri H. M. Patel, I.C.S., the then Cabinet Secretary, to:

- (i) submit an interim report on the measures necessary to meet the immediate problems of shortage of salt in various parts of the country; and
- (ii) make recommendations as to the organisation necessary for securing the maximum production and the most efficient distribution of salt at all stages.

The Committee, within two months submitted a report to Government containing several short and long-term plans for the salt industry. The recommendations of the said Committee were approved by the Government in December, 1947. The plans included the formulation of measures to step up production of salt in the country, to regulate imports so long as indigenous production fell short of consumption and to improve the quality of Indian salt. This also included the issue of a Salt Control Order giving powers to the Government under the Essential Supplies (Temporary Powers) Act, 1946 to regulate the quantity, quality, storage, distribution and prices of salt. This Committee also recommended to Government to set up a Salt Experts Committee to examine and report on each and every aspect of the salt industry in India. The issue of the Salt Control Order by the Union Government was not, however, effected as the Ministry first wanted to gain some experience of the industry. Later, on account of the introduction in the Assembly of the Industries Development Control Bill in 1949, the measure was no longer considered essential.

G.—ZONAL SCHEME

The Patel Committee suggested rationalisation of the routes of movement of salt with a special eye to the needs of the scarcity areas. As the salt works at most of the sources are laid cheek by jowl and little room exists for adequate storage the storage platforms are soon filled to capacity, when transport is not available, thus leading to the slowing down of production. This dislocates working programme and also creates discontent amongst labourers. It leads also to artificial scarcity in the markets served by respective works giving rise to an increase in prices and consequent outcry all-round. During and after the second World War when there was scarcity of railway wagons, the Ministry of Food was controlling

the distribution of salt along with other foodstuffs. The arrangement was to prepare a half-yearly programme of movement of salt to the different provinces and States and to get such programmes periodically approved by the Central Board of Transport. The Food Department used to keep a watch over the movement of salt wagons from the loading stations and reported cases of failures in the weekly meetings held by the Central Board of Transport for necessary action. After the Ministry of Industry and Supply took over the charge of salt distribution from the Ministry of Food, the same system continued till December, 1948, when question of cross movements were raised by the Central Board of Transport. The Central Board of Transport requested the Salt Controller to prepare a programme eliminating unnecessary long hauls and avoiding cross movement. Accordingly, in the meeting of the Central Board of Transport in September, 1948, the Salt Controller submitted to the Board a provisional scheme for rationalising the movement of salt in Northern India eliminating long haulage and cross movements and circulated it to Provincial Governments and Salt Manufacturers' Associations for comments. The Scheme for South India was also similarly prepared and submitted. A Sub-Committee consisting of the Chief Controller of Railway Priorities, Joint Director of Railway Board and the Salt Controller discussed this Scheme and after necessary changes in the light of the opinions and comments received submitted it to the Central Board of Transport for approval. The Board passed the Scheme in their meeting held on 25th November, 1948 and it was put into effect from 1st January, 1949 subject to minor adjustments as may be necessary from time to time in consultation with the Ministries of Transport and Railways. The Ministry of Transport issued a Press Note on 27th December, 1948 intimating the introduction of the Zonal Scheme, from 1st January, 1949 with nine zones *viz.* Sambhar, Kharaghoda, Dhrangadhra (Kuda), Bombay, Tuticorin, Adirampatnam-cum-Cuddalore-cum-Madras, Pennugudru, Naupada and Calcutta zones, with a view to avoiding transshipment, long haulage and cross movements, so as to maximise the utilisation of the available transport capacity. No booking of railway wagons was permissible from one zone to another except under special permission of the Salt Controller for reasons to be recorded in writing in each individual case. The quota of railway wagons to be allotted to each salt source or to a loading station adjacent to it was fixed by the Salt Controller in consultation with the Railway Board in accordance with a programme and salt movements were allowed by the Regional Controller of Railway Priorities concerned, from each zone in accordance with such programme. This scheme, however, does not include transport of salt by road, river or by sea.

The essence of the Scheme is that the requirements of each district is calculated on the basis of population and adding to it the requirements of industry, cattle and agriculture. The plan is to supply the requirements of each district from the nearest source as far as possible. The total demand has been calculated for each zone and adjusted against the production in the sources within the zone, keeping sufficient reserve stock to guard against any shortfall in production caused by unfavourable weather conditions and other causes. The detailed programme of movement is prepared for each zone in consultation with the State Governments and circulated to the Circle Officers and the officers attached to salt factories. They keep watch over the movement from their respective factories and bring cases of short supply whether due to short supply of wagons or for other causes promptly to the notice of their higher officers for necessary action with the railway authorities or the State Governments as the case may be.

The Zonal Scheme was first regulated under the Railway (Transport of Goods) Act, 1947 up to 31st March, 1950. Under Section 3 of the above Act "The Central Government or any person authorised in this behalf by the Central Government by notification in the official Gazette may by general or special order, direct any railway administration—

- (a) to give special facilities or preference for the transport of any of the goods specified in the second column of the Schedule, subject to compliance with the conditions, if any, set out in the corresponding entry in the third column of the Schedule, or
- (b) to refuse to carry such goods or classes of goods as may be specified in the order, either absolutely or between places so specified."

Salt was included in the Schedule under Sl. No. 5 specified in the above Section. The priority of salt was 5. This Act was amended in 1949 and was known as The Railways (Transport of Goods) (Amendment) Act, 1949. This Act lapsed on 31-3-1950. As the rail transport position after the war and the partition of the country continued to be unsatisfactory, the Government had to amend the Indian Railways Act, 1890 suitably, and a new Section 27 'A' was added to the above Railways Act with effect from 1-4-1950 to meet with the situation. Since then the Zonal Scheme is being regulated under Section 27(A) of the above Act. The Ministry of Railways (Railway Board) circulated to all the Railways under their letter No. P.T 1 (1)/50, dated 25-3-1950' about Section 27 'A' as follows:—

"The Railways (Transport of Goods) (Amendment), Act, 1949, will lapse from 31-3-1950. From the same date, the powers vested thereunder in the Operating Heads of Railways for according preferential treatment to the movement of specified goods or classes of goods and the priority classifications now in force on majority of the Railways will also lapse and the despatch of goods will be regulated with effect from 1-4-1950 on the "first come first served" principle in the ordinary manner, i. e. pre-war arrangements will again apply and although when necessary, prompt despatch of commodities such as perishables and livestock may precede other despatches, all *undue preference* must be strictly avoided.

"2. It is appreciated that the rail transport position now obtaining on certain Metre Gauge Railways and also occasionally on Broad Gauge Railways may not permit them to move all traffic offering concurrently and occasions may arise when it will be necessary in the public interest to ensure speedy movement of Military Traffic and/or essential commodities such as Government sponsored food grain, raw materials and finished products of the basic industries (Textile, Iron/Steel and Cement etc.) even when other registered traffic is not moving freely. To meet this situation, the Indian Railways Act, 1890 has been suitably amended and a new section 27 'A' has been added to the Railways Act. It reads as under:—

- "(1) The Central Government may, if in its opinion it is necessary in the public interest so to do, by general or special order, direct any railway administration to give special facilities for, or preference to, the transport of any such goods or class of goods, consigned to the Central Government or to the Government of any State or of such other goods or class of goods as may be specified in the order.
- (2) Any order made under sub-section (1) shall cease to have effect after the expiry of six months from the date thereof, but it may be renewed from time to time.

- (3) Notwithstanding anything contained in this Act, every Railway administration shall be bound to comply with any direction given under sub-section (1), and any action taken by a railway administration in pursuance of any such direction shall not be deemed to be a contravention of Section 28.

"3. Railway administrations are asked to note that the powers for giving special facilities for or preference for moving specified goods or classes of goods now vest in the Central Government (Ministry of Railways) only and that a Preferential Traffic (PT) Branch has been opened in the Railway Board's office under Mr. M. D. Sethna, Officer on Special Duty. In cases in which Railways find it difficult to move essential commodities concurrently under the 'First come first served' principle, or in other important movement matters where instructions are deemed necessary, they may refer to this office. In urgent cases, the Operating Heads of Railways may be permitted to contact this office direct.

"4. All orders for preferential movement of traffic either for commodities or for specific moves issued by the Chief Controller of Railways Priorities will cease to have effect after 31-3-1950. General and Special Orders permitting Railways to accord preferential movement to Military Traffic, Government foodgrain etc. are being issued, to have effect from 1st April, 1950 and will be valid for six months, but are liable to be cancelled or renewed from time to time as may be considered necessary in the light of transport position obtaining on various Railways. These will be the only orders regarding priority movements which will operate from 1-4-50. If any difficulty is experienced, Railways will refer to this office as indicated in para. 3 above.

"5. These instructions do not interfere with the present procedure of imposing operative restrictions as and when necessary.

"6. The Board desire these orders to be strictly observed and the revised arrangements made known to all concerned."

Since the introduction of Section 27 'A' in the Indian Railways Act, 1890, the Railway Administrations have been giving special facilities for or preference to the transport of salt when such movement is in accordance with the Zonal Scheme programmed by the Salt Commissioner with the approval of the Railway Board. The Railway Board, review the general transport position every six months and issue general and special orders to all Railways for preferential traffic of certain essential commodities which also include 'Salt'. In the priority list, 'Salt' has been placed under category 'C'. Besides, the above preferential traffic, the Railways also allow salt traffic under 'ordinary booking' according to 'First come first served' principle of the railways, after the Railway has been able to meet the demand of preferential traffic under the Zonal Scheme. The priority of such 'ordinary traffic' is item 'E' of the Railway Board's General Order issued from time to time.

All State Governments appreciate the working of the Zonal Scheme inasmuch as it has ensured even distribution of salt to all districts and for stabilisation of the prices at a reasonable level. The past tendency of unscrupulous traders to create artificial scarcity in a particular locality and to rush in salt when the price had gone high, has been checked by it. The Scheme is flexible and revisions are made from time to time in the boundaries of the zones on representations from the State Governments and trade and also taking into consideration the stocks of salt and transport condition at the source. At the end of each year, the quota fixed for each State is reviewed with due regard to increase or decrease in population and demand

for industry and cattle. The Salt Experts' Committee which also examined this question remarked in their report in 1950: "We fully support the principle of the Zonal System and urge its continuation even when railway transport has eased". After the introduction of the Zonal Scheme, for the first three years, the district-wise allocations were also made by the Salt Commissioner. Since 1952, the internal distribution of salt being mainly the responsibility of the State Governments, the Salt Commissioner has been allocating bulk quota to each State from respective sources leaving the district-wise distribution to the State Governments concerned. The State Governments send such allocation lists to the Officers in-charge of the Salt Source, and supplies are made accordingly.

The total number of zones was reduced to seven in 1951 as Sambhar, Kharaghoda, Dhrangadhra, Bombay, South Madras, North Madras and Calcutta zones and raised to eight in 1954 as Sambhar, Kharaghoda, Dhrangadhra, Bombay, Madras, Andhra, Calcutta and West Coast (Kandla) zones.

The Salt officers compile statistics of movement of salt by rail to different destinations as well as movements by road, river and sea from different factories in a systematic way so that the Department is in a position to know accurately not only the production of each licensed factory, but also clearances from it and regulate movement according to necessity.

Supplies from Government salt works at Sambhar, Pachbadra, Didwana and Kharaghoda continued to be made by the Registered dealers appointed by the Government for the purpose through the State Government nominees either appointed under their respective Control Orders or executive orders issued by them. Movements of salt were, however, in accordance with the Zonal Scheme. When this system of supplies by the Registered dealers from Government sources was abolished with effect from 28-4-1950, the above nominees commenced to place indents for salt either direct or through their authorised agents. Supplies of salt to industrial concerns from the Government sources are being allowed to those industries and approved agents who were appointed by the Collectors of Central Excise when there was duty on salt, and by the Salt Commissioner since its abolition. Lists of such industries and approved agents are reviewed by the Salt Commissioner each year along with the Zonal Scheme and their quotas revised on the basis of their performance during the last two-three years.

H—ZONES AND ZONAL ARRANGEMENTS

1955 Zones and the Zonal Arrangements are given below:—

Name of Zone	Salt Sources which are included in the zone	States fed by the Zone	Total quantity of salt allotted to the Zone ('000 mds.)
1	2	3	4
1. Sambhar	Sambhar Lake, Pachbadra, and Didwana, Govt. Salt factories in Rajasthan.	North Bihar, South Bihar (for Rohtas Industry); Uttar Pradesh; Punjab, Delhi, Ajmer, Himachal Pradesh; Pepsu, Rajasthan, Madhya Bharat, Jammu and Kashmir and Nepal.	95,80

1	2	3	4
2. Kharaghoda	Inland Govt. Salt Factory at Kharaghoda and the Inland private salt factories at Patdi in Bombay, Dehgam and Bajana in the Little Rann of Kutch in Saurashtra.	Bombay, Uttar Pradesh, South Bihar, Madhya Pradesh, Jammu and Kashmir, Madhya Bharat, Rajasthan, Bhopal, Vindhya Pradesh and Nepal.	85,95
3. Dhrangadhra	Inland Salt factories at Kuda, Jesda, Maliya, Vansar, Halvad etc. in the Little Rann of Kutch in Saurashtra.	North Bihar, South Bihar, Bombay, Madhya Pradesh, Uttar Pradesh, Madhya Bharat, Saurashtra, Rajasthan and Nepal.	43,20
4. Bombay	Sea salt factories in Bombay State excluding Mithapur Works.	North Bihar, South Bihar, Bombay, Madras, Andhra, Madhya Pradesh, Hyderabad, Madhya-Bharat, Mysore, West Bengal and Vindhya Pradesh.	1,23,80
5. Madras	Sea Salt factories in Madras, Travancore-Cochin and Tada factory of Andhra.	Madras; Coorg; Andhra; Hyderabad; Mysore and Travancore Cochin.	1,21,35
6. Andhra	Sea Salt factories in Andhra State excluding Tada factory which is in Madras zone.	South Bihar, Madhya Pradesh; Andhra, Orissa; Hyderabad and West Bengal.	60,80
7. Calcutta	Sea salt factories in West Bengal; Salt imported into Calcutta by sea and sea salt factories in Orissa.	Assam; N. & S. Bihar, West Bengal; Manipur, Tripura, Sikkim, Bhutan and Nepal for the Calcutta source and Orissa for the Orissa source only.	Calcutta source 1,21,85 Orissa 14,00 <hr/> 1,35,85
8. West Coast	Maritime salt factories in Kutch (Kandla) and Saurashtra and Mithapur in Bombay.	(i) From Saurashtra; Saurashtra and N. Bihar (ii) From Kandla: Kutch and Uttar Pradesh; (iii) From Mithapur, Amreli Dist. of Bombay.	Saurashtra & Mithapur 35,10 Kandla 15,40 <hr/> 50,50
9. Mandi (Out-side the Zonal Scheme as rail traffic is not involved).	Rock Salt Source at Mandi.	Punjab; Jammu & Kashmir and Himachal Pradesh.	136

The above figures do not include the Coastal salt traffic by sea from the sources concerned, nor do they include the quota of salt for export by sea.

Distribution in terms of wagons

Salt Source	B.G. Wagon M.G. Wagon	1951-52			1952-53			1953-54			1954-55		
		Zonal quota	Indents placed	Wagons moved	Zonal quota	Indents placed	Wagons moved	Zonal quota	Indents placed	Wagons moved	Zonal quota	Indents placed	Wagons moved
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sambhar	M.G.	35,709	35,709	27,287	25,049	25,047	22,195	25,968	34,610	19,374	31,556	45,184	25,846
Pachbadra	M.G.	4,593	4,146	4,063	3,790	3,124	2,856	4,233	2,728	2,504	4,550	3,092	3,080
Didwana	M.G.	6,688	6,215	5,214	6,695	2,916	2,804	6,666	3,144	3,136	4,716	1,827	1,827
Total of Sambhar Zone		46,990	46,070	36,564	35,532	31,086	27,855	36,867	40,482	25,018	40,822	50,103	30,753
Kharaghoda	B.G.	11,786	14,458	11,067	13,640	14,172	12,595	14,787	15,471	13,855	15,204	15,590	13,358
Dhrangadhra	M.G.	8,785	8,677	7,814	12,431	8,494	8,424	11,457	15,923	10,617	11,457	15,923	10,617
Bombay	B.G.	18,290	17,414	14,126	18,971	23,097	17,796	17,214	19,892	17,158	17,634	21,724	18,310
West Coast (Kandla)	M.G.	..	..	..	1,260*	676*	654*	4,800	4,174	3,915	4,800	3,601	3,168
Madras and Andhra Zones (Madras, Andhra and Travancore-Cochin).	B.G. & M.G.	30,092	21,660	19,559	26,177	18,869	17,677	24,428	24,697	22,598	20,621	13,801	13,095
Calcutta	B.G.	11,901	10,679 (a)	11,981	16,135	11,070 (a)	13,938	12,187	7,830 (a)	11,246	13,004	4,020 (a)	11,009
Orissa	B.G.	..	1,264	1,283	..	864	878	..	1,030	1,009	1,716	826	827

*January—March 1953.

(a) Reason for less indents is that indents placed by the traders themselves for 'ordinary' traffic of salt have not been included. Since 1953-54, on account of satisfactory wagon position for supply to B.G. destination, like South Bihar, majority of the movement is under 'ordinary' traffic.

The Zonal Scheme for salt movement is flexible. Adjustments of Zones are made from year to year and even in the course of a year, on the basis of salt production and transport position at the sources concerned. The normal overall quota of Sambhar Zone (Sambhar, Pachbadra and Didwana) is about 125—130 lakh mds. per annum on account of failure of rainfall in Rajasthan the salt production especially at Sambhar Lake dropped down to 55–60 lakh maunds against the normal production of 95–100 lakh maunds. This has necessitated reduction of Sambhar Zone quota to 95–100 lakh maunds per annum. To make up this deficit, area of other zones and their quotas had also to be correspondingly increased; viz. Khara-ghoda quota has been increased to 86–88 lakh maunds from previous quota of 60–65 lakh maunds; Dhrangadra quota from 20–25 lakh maunds to 40–43 lakh maunds, and so on. This increase is not only owing to reduction of Sambhar quota but also on account of reduction of Calcutta quota from 150–160 lakh maunds to 120–125 lakh maunds.

During the war owing to the scarcity of shipping space, salt was transported by rail even from Kathiawar to Bengal, Bihar, Assam etc. and this practice continued even after the war. Owing to heavy burden put upon the railways by the large traffic that was offered and their inability to cope with it because of scarcity of locomotives and wagons, distribution of salt was seriously hampered. Though there has been considerable improvement in rail traffic since the introduction of the Zonal Scheme, yet there is enough scope for further improvement as there are still shortages of engine power and empties. Movements of salt suffered also due to heavy movements of food-grains and other more important essential commodities, especially from Bombay and other ports. The scheme in terms of wagons is given in the statement at page 429.

I.—CONTROL ORDERS

Control over salt production is exercised by the Salt Commissioner under the Central Excise and Salt Act, 1944 and the Central Excise Rules, 1944 framed under the above Act. The Central Government do not exercise any control over distribution and prices either ex-works (from private factories) or in the consuming areas under any statutory order. Some of the State Governments have, however, issued Control Orders on distribution, some on prices and some on both under the Ministry of Food, Government of India Notification No. PY-603(2)-1, dated 20th October, 1946 issued under the Essential Supplies (Temporary Powers) Act, 1946 with the concurrence of the Central Government. Below is a statement showing the States which have issued Salt Control Orders or Notifications under the Essential Supplies (Temporary Powers) Act, 1946, dates of issue of such Orders or Notifications and the scope of the Order or Notifications:—

Sl. No.	Name of State	Date or year of issue of control Orders or Notifications	Scope of the Order or Notification
1	2	3	4
1	Uttar Pradesh	U. P. Salt Control Order, 1947 (issued on 3-9-1947).	Control on imports, distribution and prices of salt (wholesale and retail).
2	Punjab	East Punjab Salt (Distribution and Price) Control Order 1947 (issued on 15-10-1947).	Ditto.

1	2	3	4
3	Madras . . .	Notification dated 4-10-1947.	Control on ex-factory wholesale and retail prices of salt.
4	Madhya Pradesh .	Central Provinces and Berar Salt (Control) Order, 1948 (issued on 17-8-1948).	Control on ex-factory wholesale and retail prices of salt (with certain relaxation in regard to salt imported into the State from Bombay).
5	Orissa . . .	Notification dated 10-6-1950 .	Control on ex-factory price of salt.
6	Delhi . . .	Notification dated 27-9-1949 and subsequent notifications issued from time to time. Notification dated 20-4-1953 and 23-4-1954.	Control on ex-factory price. Control on manufacture, sale and transport of Sambhar salt in 'Blocks' or in any other shape or form except refined salt from Delhi State to any place outside the State.
7	Himachal Pradesh	Himachal Pradesh (Distribution and Price) Control Order, 1949 (issued in September 1949).	Control on import, distribution and wholesale and retail prices.
8	Ajmer . . .	Ajmer-Merwara Salt Prices Control Order, 1947 (issued on 7-2-1947).	Control on wholesale and retail prices of salt in the State.
9	Madhya Bharat .	Madhya Bharat Salt (Control) Order, 1949 (issued on 28-2-1949).	Control on import, distribution and wholesale and retail prices of salt.
10	Saurashtra . . .	Saurashtra Salt Dealers Licensing Order, 1949 (issued on 23-11-1949).	Control, sale and distribution of salt within the State.
11	Assam . . .	Assam Controlled Commodities Distribution Order, 1950 (issued on 5-12-1950).	Control on import, distribution and retail prices of salt.
12	Bihar	Notification dated 11-2-1953.	Controls export of salt from the State.
13	Vindhya Pradesh .	V. P. Salt (Distribution and Price) Control Order, 1952 (issued on 19-2-1952).	Control on import, distribution and wholesale and retail prices of salt.
14	Bhopal	Notification dated 26-12-1950.	Control on wholesale and retail prices of salt.
15	West Bengal . . .	West Bengal Notification 4273-F.D., dt.28-4-54 and No.7775, dt. 30-7-1954.	Control on manufacture, sale and transport of 'Block' salt.
16	Hyderabad . . .	Notification No. 4, dated 26-4-1954.	Ditto.

J.—SALT (RESERVE STOCKS) ORDER, 1950

Besides the above control Orders issued by the State Governments, the Central Government issued a Control Order on 17-3-1950, called the Salt (Reserve Stocks) Order, 1950 under which every importer of salt into Calcutta by sea, whether from foreign countries or indigenous sources, is required to store in the Government Golahs at Salkia (Howrah) not less than a certain percentage of the quantity of salt imported by him as fixed by the Salt Commissioner or the Government from time to time (at present $7\frac{1}{2}\%$). The intention is to keep adequate quantities of salt as reserve stock under the control of the Government to meet any emergent situation in places served by Calcutta. Small imports below 2,000 tons from Tuticorin in Madras were, however, exempted from the operation of this Order. This exemption was extended to all imports by sea from all indigenous sources and the quantity reduced to 1,000 tons. The exemption at present extends to all consignments not exceeding 3,000 tons in any single ocean going Vessel. The aforesaid Control Order as amended up to 1955, by the Government and issued under the Essential Commodities Act, 1955 is given below:

GOVERNMENT OF INDIA
MINISTRY OF PRODUCTION
New Delhi, the 27th May, 1955

NOTIFICATION

No. SRO(1185)ESS. Com/Salt(3).—In exercise of the powers conferred by Section 3 of the Essential Commodities Act, 1955 and in supersession of the notification of the Government of India in the Ministry of Production No. SRO-707, dated the 23rd March, 1955, (10 of 1955), the Central Government hereby make the following Order, namely:—

- (1) This Order may be called the Salt (Reserve Stocks) Order, 1955.
- (2) It shall come into force on the 1st June, 1955.

2. In this Order,—

- (a) “importer” means a person who imports salt at Calcutta by sea, whether from foreign or indigenous sources;
- (b) “Salt Commissioner” means the Salt Commissioner to the Government of India.

3. Every importer of salt shall store, not less than fifteen per cent of the quantity of salt imported by him, in the Government golah at Calcutta, but the Salt Commissioner may, at his discretion, vary from time to time, the percentage of salt to be stored so however as not to reduce it below 5 or increase it above 15.

4. The quantity of salt stored under paragraph 3 shall be treated as a reserve and no dealer shall sell or otherwise dispose of such quantity of salt or any part thereof, without the permission in writing of the Salt Commissioner or any officer authorised by him in this behalf.

5. All small imports not exceeding 1,000 tons are exempted from the operation of this Order.

(Sd). A. NANU,
Deputy Secretary to the Government of India.

Under clause 4 of the Order, any salt stored in the golahs by an importer over and above his requisite quantity of reserve stock under clause 3, is also liable to be considered as reserve stock. This was relaxed with effect from 1st March, 1952, and the importer was at liberty either to keep his stock of such salt in the golahs or could dispose of the same without any restriction by Government. It has been laid down under the above order that a certain quantity of minimum balance of reserve stocks of salt should always be maintained in the Golahs and stocks of salt over and above the same shall be notified once in a fortnight for release generally according to chronological order of storage.

The Commodity Controls Committee set up by the Ministry of Commerce and Industry which examined all questions of controls issued under the Essential Supplies (Temporary Powers) Act, 1946 and other allied Acts, recommended in 1953, that:

- “(i) The Salt (Reserve Stocks) Order, 1950, should be retained, but in the present easy position of salt production, a reduction to 12 lakh maunds from 17 lakh maunds of the stock of salt at the Government golah at Calcutta should be feasible.” (The present minimum balance has been fixed at 12 lakh maunds with effect from May, 1954.)
- “(ii) As regards the percentage of salt to be stored by the importers in the golahs, the Salt Commissioner by an amendment of the Order be empowered to vary the percentage between 5 and 15 per cent. The present percentage, viz., 10 may be reduced by the Commissioner to 5”.

K.—NOMINEE SYSTEM

During and after the second World War there has been serious transport difficulty all over the country. The nominee system owes its inception to such transport difficulties when it was found that unscrupulous traders indulged in malpractices in regard to the wagons allotted to them. To overcome these malpractices and to ensure continued supply of salt to the consumers many of the State Governments took measures to appoint their own nominees for importing salt into their States.

Since then some of the States have been regulating imports of salt through their own nominees either under Salt Control Orders issued by them under the powers delegated to them under Notification No. PY. 603 (2) II, dated 21st October, 1946, issued by the Department of Food as continued in force, under the Essential Supplies (Temporary Powers) Act, 1946, or by issue of Executive Orders for the purpose. These nominees are generally appointed by officers such as “District Magistrates” or “Deputy Commissioners” to whom the necessary powers have been delegated by the respective State Governments.

The present system of imports of salt into different States falls under three categories:—

- (i) Some States have issued Salt Control Orders and regulate imports into their States through the nominees appointed by the District Magistrates or other State Government authorities. They also regulate distribution of salt in their States under their respective Control orders. The States are Uttar Pradesh, Punjab, Himachal Pradesh, Madhya Pradesh (for Kharaghoda salt), Madhya Bharat, Vindhya Pradesh and Assam.

- (ii) Some allow imports of salt into the States through district nominees under their executive orders without any statute; the States are Delhi, Ajmer, Pepsu, Bilaspur, Bombay (from Kharaghoda); Jammu and Kashmir (on Government to Government basis); Rajasthan, Bihar and Northern districts of West Bengal (Darjeeling, Coochbihar, West Dinajpur).
- (iii) Some States do not exercise any kind of control either on imports into or distribution in their States; such as, Bombay, (except from Kharaghoda), West Bengal (except the above four districts), Hyderabad, Mysore, Orissa, Travancore-Cochin, Kutch, Coorg, Manipur and Tripura.

As the country has attained self-sufficiency in salt, the working of the Nominee system came in for severe criticism at the hands of the salt traders and the Chambers of Commerce. This question was, therefore, examined by the Commodity Controls Committee. They, in their Report, published in 1953, stated:—

“We have considered all the points for and against the continuance of the Nominee System and also noted that the State Governments concerned hold strong views in this matter. We feel that the problem should be considered in the light of the main object to be achieved, viz. that the consumer should get his supplies of salt regularly and at a fair price. In our view, the Nominee System has outlived its utility, but since the States where the System is prevailing are very strongly opposed to its removal, we recommend that in the first instance these States should allow ‘free’ imports also, that is, traders other than the nominees should be allowed to take salt into the States, in addition to the nominees. We may observe that ‘free’ imports of salt are allowed in the Madhya Pradesh State, where the adoption of such a measure has worked satisfactorily. The Central Government may review the position at the end of the year, and if necessary withdraw the delegated powers to the States in regard to the continuance of the Nominee System, except in respect of those States where the transport position still continues to be difficult.”

The Government have since decided to implement the above recommendations of the Commodity Controls Committee, and have abolished the Nominee System in most of the States either wholly or partially in consultation with the State Governments. Government want to abolish the system wholly by stages so that sudden relaxation may not inconvenience the consumer in any way. The States who have abolished the Nominee System wholly or partially are shown below:—

Name of the State	Extent to which the Nominee System has been abolished
Himachal Pradesh	25%
Delhi	25%
Pepsu	33%
Ajmer	100%
Bihar	100%
Rajasthan	100%
Madhya Pradesh	33%

Name of the State	Extent to which the Nominee System has been abolished
Vindhya Pradesh . . .	Free supply along with nominee system.
Punjab	100%
Bhopal	33%
Uttar Pradesh . . .	100% in respect of supply from Kandla and Dhrangadhra. In respect of supply from Kharaghoda, the State Government had also abolished the system in full but as the system of indenting at the Government Works is yet to be finalised the nominee system has still been con- tinuing.
Madhya Bharat . . .	100%
Bombay	100%
Assam	100%

At Sambhar, however, free indenting (on experimental basis) with safeguard against over-indenting has been introduced with effect from the 1st August, 1956 for supply to Punjab, Ajmer, Himachal Pradesh, Pepsu & Delhi against the quota released by them for free trade. According to this system 50 per cent of the released quota is being indented by the District traders and the other 50 per cent by the Sambhar traders.

CHAPTER XXI

PRICES OF SALT IN INDIA

A.—GENERAL

Compared to other foodstuffs the prices of salt are very low indeed. Even then some criticism is made that these are high and because of this, the needs of the population, livestock, industry etc. are not being met adequately. India is a vast country. Excepting a few inland salt centres, 70—75% of the salt producing centres are on the sea coast. The bulk of the salt produced has to be transported inland to the consuming areas by rail, road, river, etc. It is, therefore, inevitable that the cost of salt at places which are at considerable distances from the producing centres must necessarily be high owing to the addition of the freight and other incidental charges. Another factor which is also responsible for the higher price is the cost of gunny bags which is higher than the price of salt packed in them. The bags are manufactured in the Calcutta Jute mills from where these have to be transported to various producing centres. This causes higher price of gunny bags.

Salt price to the consumer is composed of the following elements:—

- (i) Cost of production;
- (ii) Government charges (duty or cess as the case may be);
- (iii) Price of bags;
- (iv) Despatch and other expenses, if any (carriage from factories, bagging and sewing charges, weighing, loading charges, etc.);
- (v) Total ex-factory price;
- (vi) Transport charges from the factory to consuming areas (Railway freight/Steamer freight etc.);
- (vii) Unloading and loading charges at the Railway or steamer station, etc.
- (viii) Cartage to godown and from godown to shops, stacking of bags in godown etc.;
- (ix) Godown rent;
- (x) Commission, if any, to intermediaries;
- (xi) Margin of wholesalers' and retailers' profit;
- (xii) Other sundry factors, such as inadequate supplies, owing to shortage of wagons and other transport facilities, etc.

Many of these elements vary from factory to factory, centre to centre, State to State, town to town, village to village, dependent on local conditions.

(i) *Cost of Production.*—This varies from factory to factory depending upon natural and other factors such as rainfall, wind velocity, humidity

size of the unit, financial position of the proprietors, situation of the factory, competition with unlicensed works etc. In Saurashtra there are very big units, conditions for salt manufacture are ideal, brine supply is by tides, units are very big and the cost of production, therefore, is low. On the other hand, factories in Travancore, Orissa and even in Bombay labour under certain disadvantages. The units are small, in cases of some factories sea-brine is not available and pit-brine has to be used, the weather conditions too are not so favourable and, therefore, the cost of production rises. Factories in Madras have a large number of unlicensed works near about them which are a menace to them, and therefore, have to sell at much lower profits than factories in Bombay or Saurashtra. Factories in Orissa have disadvantages owing to weather conditions being not so favourable; crystallisers being situated far away from the platform which increases costs and so on. It will, therefore, be clear that the ex-works price of salt depends on many factors and varies from place to place. Ex-works price in Saurashtra ranges from Re. -/8/- to -/11/- per maund (excluding price of bags as it generally moves in bulk in ships) in the case of marine works and from Re. -/14/- to -/15/- in the case of inland salt works; in Orissa it is Rs. 1/4/- per maund; in Travancore it ranges from Re. -/13/- to Rs. 1/6/- per maund; in Bombay it ranges from Re. 1/-/2 to Rs. 1/7/- per maund and so on. These are just averages, but, as mentioned above, it varies from factory to factory.

(ii) *Government charges (Duty or Cess as the case may be).*—Prior to 1-4-47, when there was duty on salt, incidence of taxation which was added to the price of salt was Rs. 1/9/- per maund or 7·5 pies per seer. Its incidence after the abolition of duty since when cess is being levied is annas two per maund or 0·6 pies per seer on salt cleared from private factories and Re. -/3/6 per maund or 1·05 pies per seer on salt cleared from the Government factories. The present incidence is, however, negligible and is not at all a factor in computing the price structure of salt. This is only a theoretical incidence from the consumer's angle because this sum is exceedingly small.

(iii) *Price of bags.*—Bags are indispensable in the matter of wholesale and retail transactions of salt. Salt cannot be transported from the place of production to consuming centres without the bags. So, its price is an important factor in computing the price structure of salt. Before the second World War and before the Partition the prices of bags were low. After partition, the main jute producing centres went in East-Pakistan, which caused higher prices of jute bags. The present price of a 2 1/2 maund capacity bag is about Re. -/12/- to -/13/- (Rs. 75 to Rs. 80 per 100) against Re. -/4/- to -/5/- in pre-war and pre-partition days.

(iv) *Despatch and other expenses.*—Some factories at some centres are favourably situated and have railway sidings, but many factories are 3, 4, 5 and 6 miles and even more from the rail heads. The result is that carriage is necessary and is an appreciable element; may come to Re. -/2/- to -/3/- a maund or even more. Besides the carriage charges from the factory to the rail heads, there are some other charges like bagging and sewing charges, weighing, loading charges, etc.

(v) *Total ex-Factory price.*—Thus the ex-factory price which is made up of cost of production, Government charges, bags, despatch and other ex-

penses, ex-works, accordingly vary from factory to factory and place to place as shown in the statement below:—

Name of the Source	Cost of production (selling price) per maund	Cess per maund	Prices of bags empty (per maund)	Despatch and other miscellaneous charges, if any (per md.)	Total ex-factory price (per md.)	Remarks
1	2	3	4	5	6	7
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
<i>Govt. Sources :</i>						
1. Sambhar	0 10 0	0 3 6	0 4 9	0 1 6	1 3 9	
2. Pachbadra	0 10 0	0 3 6	0 5 1	0 1 9	1 4 4	
3. Didwana	0 8 0	0 3 6	0 5 0	..	1 3 6	
4. Kharaghoda	0 10 0	0 3 6	0 4 3	0 0 7	1 2 4	
	0 10 6	0 3 6	0 4 3	0 0 7	1 2 10	
<i>Private Sources:</i>						
<i>Bombay</i>						
Bhayandar Circle	0 7 0 to 0 8 0	0 2 0	0 7 0 to 0 10 0	0 2 0 Gr. rent.	1 0 2 to 1 6 2	
Bhandup Circle	0 7 0 to 0 8 0	0 2 0	0 7 0 to 0 10 0	0 2 0 Gr. rent.	1 0 2 to 1 6 2	
Wadala Circle	0 7 0 to 0 8 0	0 2 0	0 7 0 0 10 0	0 2 0 Gr. rent & 0 0 9 to 0 1 0 Municipal charges.	..	
Uran Circle	0 7 0 to 0 8 0	0 2 0	0 7 0 to 0 10 0	0 0 2 Gr. rent.	1 0 2 to 1 7 0	
Kharaghoda	0 7 0 to 0 9 0	0 2 0	0 8 0 to 0 12 0	..	1 1 0 to 1 7 0	
<i>Saurashtra and Kutch</i>						
Maritime Works (for inland consumption).	0 6 0 to 0 8 0	0 2 0	Shipped in bulk.	0 0 3 to 0 0 7 Royalty.	0 8 3 to 0 10 7	
...						
Inland salt works (Dhrangadhra etc.).	0 7 0 to 0 8 0	0 2 0	0 4 3	0 0 7 Royalty & 0 1 0 Bagging & Sewing.	0 14 10 to 0 15 10	

	1	2	3	4	5	6	7								
Humma Circle (Orissa).	0	9	0	0	2	0	0	6	0	0	3	0	1	4	0
										(including profit of 0 0 3).					
West Bengal	1	11	0	0	2	0	0	4	0	0	7	0	2	8	0
										(including profit of 0 0 6).					
Naupada Circle (Andhra).	0	5	4	0	2	0	0	8	0	0	2	0	1	1	4 to
	to	0	12	0									1	8	0
Penugudur (Andhra).	0	6	9	0	2	0	0	7	0	0	5	3	1	5	0
Madras Circle (Madras and Andhra).	0	6	0	0	2	0	0	8	0	0	6	0	1	6	0
Cuddalore Circle (Madras).	0	5	0	0	2	0	0	7	0	0	1	0	0	15	0
	to	0	11	6									to	1	5 6
Tuticorin Circle (Madras).	0	6	0	0	2	0	0	5	0	0	2	6	0	15	6
Travancore-Co- chin.	0	6	0	0	2	0	0	3	6	0	1	6	0	13	0
	to	0	8	0			to	0	4	6	to	0	2	0	to 1 6 0

(vi) *Transport charges from the factory to consuming areas.*—The present classification of Railway freight on salt is WL/1 and the freight is 0.43 pie for the first 300 miles plus 0.23 pie for the next 200 miles plus 0.15 pie for distances beyond i.e. freights of salt per maund are as follows:—

	Rs. a. p.	
Place at a distance of 20 miles	0 0 9	} Per maund (exclud- ing terminal, short distance, trans- shipment charges etc.).
Place at a distance of 50 miles	0 1 10	
Place at a distance of 100 miles	0 3 7	
Place at a distance of 200 miles	0 7 2	
Place at a distance of 250 miles	0 9 0	
Place at a distance of 500 miles	0 14 7	
Place at a distance of 750 miles	1 1 9	
Place at a distance of 1000 miles	1 4 10	

So, at present the F. O. R. destination prices of salt at the rail-head say from Bombay are:—

Destination rail-head (distance from source)	Ex-works price per maund	Railway freight per maund	F.O.R. at Destination rail-head (per maund)
	Rs. a. p.	Rs. a. P.	Rs. a. p.
20 miles	1 6 2	0 0 9	1 6 11
100 miles	1 6 2	0 3 7	1 9 9
250 miles	1 6 2	0 9 0	1 15 2

It will be seen that transport charges depend on distances. There is a difference of about Re. -/8/- a maund between places 20 miles and 250 miles; between places 100 and 1,000 miles from the source, the difference is about Rs. 1/2/- per maund.

(vii) *Unloading and loading charges at the destination station.*—These charges vary according to labour rates, but the variation is not likely to be very great.

(viii) *Cartage to godown and from godowns to shop, etc.*—These also vary from town to town and State to State depending on the labour, bullock cart and other transport rates, but the difference is not likely to be appreciable.

(ix) *Godown rent.*—This too varies from town to town; in big towns like Calcutta, Delhi, Bombay, Madras, Kanpur etc. it is generally higher than in moffusil towns. Such rent is cheaper in villages.

(x) *Commission, if any, to intermediaries.*—A nominal charge as commission is generally levied by the agents who advance price of salt and bags, railway freight etc., especially for supply from the Government works. Such charge varies from 6 pices to 1 anna per maund.

(xi) *Margin of wholesalers' and retailers' profit.*—These vary from State to State and place to place. Some States which issued Price Control Orders for regulating the price of salt have fixed such margins but they vary from State to Stae, such as:—

- (i) Uttar Pradesh (a) Wholesalers' profit at the rate of 5%.
(b) Retailers' profit at the rate of 10%.
- (ii) Punjab & H. Pradesh The District Magistrates may fix the margin according to local conditions, etc.
- (iii) Madhya Pradesh (a) Margin of profit not exceeding 10% in case of sales in bags of 2 maunds and above.
(b) Profit not exceeding 5% in case of quantities less than two maunds in one transaction.

- (iv) Madras (a) Wholesalers' profit—6½ %.
- (b) Retailers' profit—to be fixed by the D. Ms. on the basis of wholesale price.
- (v) Ajmer (a) Agents' profit including incidental charges @ -/12/- per bag of 2 1/2 maunds.
- (b) Wholesale do.
- (c) Retail profit including incidental charges @ -/10/- per bag of 2 1/2 mds.
- (vi) Madhya Bharat The Director shall fix the wholesale and retail prices in different parts according to local conditions.
- (vii) Delhi Sambhar salt (a) wholesale—Ceiling price Rs. 2/8/- per maund.
- (b) Retail—Ceiling price Rs. 3/2/- per maund.
- (viii) Vindhya Pradesh The Deputy Commissioner shall fix the margin of profit according to local conditions.
- (ix) Bhopal (a) Wholesalers' commission Re. -/2/8 per maund.
- (b) Retailers' commission Re. -/4/- per maund.

and so on.

(xii) *Other sundry factors such as inadequate supplies owing to shortage of wagons and other transport facilities, shortfall in production, etc.*—Prices mostly depend on cost of production of salt, freights etc. though economic factors, such as copious and inadequate supply and other marketing conditions do affect. Sometimes, wagon supply is inadequate, particularly on metre gauge sections and the traders take advantage of this situation by boosting up the prices. Sometimes salt supplies get dislocated owing to fairs like Kumbha Fair, Sugar Season, arrival of food-ships, famine measures, etc.

B.—SELLING PRICE OF SALT IN GOVERNMENT SALT WORKS

During the duty days the policy of the Government was to confine its revenue from salt to the yield of the salt duty and to make no profit out of manufacture; and selling prices at Government salt works, therefore, had always been fixed so as to cover only the cost of production, with a small addition for such services as bagging, weighing and loading. Competition from other factories and in some areas from Government salt, and perhaps to some extent the presence of Government officers at the

factories, kept the selling prices at privately owned works also very moderate, though in certain places there had been appreciable rise during the second World War. The following table gives representative ex-factory prices (without bags) per maund in recent years:—

Source	Pre-war (1939)	War-period (1940-45)	After war (1946)	Present (1955)
Sambhar	0 4 3	..	0 4 6	0 10 0
Kharaghoda	0 4 0	..	0 5 0	0 10 6
Bombay Sea Salt Works	0 3 0 to 0 6 0	..	0 6 0 to 1 0 6	..
Madras	0 1 0 to 0 8 5	..	0 4 0 to 0 9 0	..
Orissa	0 4 10 to 0 5 1	..	0 11 0	..

RECOMMENDATIONS OF THE DEPARTMENTAL COMMITTEE

Even after the abolition of salt duty, the selling price of salt in Government factories had all along been fixed on a 'no profit no loss' basis. The cost of production at the different Government sources was so long calculated in accordance with the procedure fixed by Government in 1935-36 and all relevant items of cost were taken into account. When the salt duty was in force, a certain portion of the expenditure of the salt sources was not taken into account in the cost of production, as such expenditure was considered an appropriate charge against the collection of duty. This included items of expenditure on establishment, treaty payments etc. Since the abolition of salt duty, all the expenses incurred by the salt sources are being debited to the cost of production. The Departmental Committee which was formed by the Government of India with Shri B. B. Paymaster, I.C.S., Dy. Secretary, Ministry of Production as Chairman, Shri A. Baksi, Dy. Secretary, Ministry of Finance (Later Shri B. S. Bhatnagar, Dy. Secretary, Ministry of Finance) and Shri S. C. Aggarwal, Salt Commissioner *vide* their order No. Salt-5 (32)/51, dated 7-6-1951 and 20-9-1951, reported about the question of fixation of selling price of salt from Govt. factories as follows:

"The Salt Experts Committee which reviewed the present method criticised only the provision made for depreciation and the remuneration allowed for Capital. They suggested that depreciation should be calculated on a more liberal basis, the amount to be provided being not less than 5% of the value of fixed assets. They also felt that there was full justification to provide in the prices for a remuneration of 10% of the value of the fixed assets, in addition to interest.

"We feel that these two suggestions of the Salt Experts Committee should be given effect to immediately. In regard to depreciation, we would suggest that the normal rates of depreciation currently allowed by the Income-tax authorities should be adopted and applied to the written-down value of the fixed assets. As regards remuneration for Capital we would recommend that the remuneration should be divided into two parts:

(i) interest on working capital; and (ii) return on block (fixed assets). Interest may be calculated at the rate of 4% on the working capital of the Salt Sources, which may be assumed to be equal to one-third of the total cost of production (excluding depreciation). The return on block may be calculated at the rate of 10% of the original value of the fixed assets employed at the salt sources.

“As regards the issue prices of salt itself, we feel that the present cost of production justifies an increase. The latest audited accounts available relate to 1951-52, and based on these accounts, the current cost of production has been calculated and shown in the attached statement. About fifty per cent of the cost of production consists of items which are, more or less, of a fixed nature and which are not affected by the quantum of production. Any substantial variation in the quantity of salt produced in a year will thus affect the cost of production, the cost being more if production is less, and *vice versa*. It is, therefore, considered that the estimate of cost on which issue prices are fixed should be based on the normal output which can be expected under average conditions. The average production in the last seven years works out to 90 lakh maunds in Sambhar, 14 lakh maunds in Pachbadra and 12 lakh maunds in Didwana. The production in Sambhar during the last four years has varied very widely (between 50 and 104 lakh maunds) and we therefore feel it advisable to take 80 lakh maunds as the normal production, instead of 90 lakhs, which is the average of the last seven years. In the case of the other two sources the average of the last seven years has been taken as the normal production. The estimated cost calculated on this basis is shown alongside the costs of 1951-52 in the statement attached. The weighted average cost of all the sources has also been shown in this statement.

The actual cost for 1951-52 and the estimated cost based on normal production are as below:—

	Actual cost for 1951-52	Estimated cost based on normal production
Sambhar.	0 7 2.4	0 8 5.8
Pachbadra	0 9 9.2	0 9 4.5
Didwana.	0 6 6.7	0 7 5
Kharaghoda	0 9 8.7	0 10 4
Weighted Average	0 8 1.2	0 9 0.19

“While fixing the prices for the salt of the three Rajasthan sources in March, 1950, the Government of India desired that an attempt should be made to fix a uniform price for the salt of all the Government sources. The present prices in the Rajasthan Salt Sources are seven annas per maund for Sambhar and Pachbadra Sources while at Didwana, the price is six and a half annas i.e. 6 pies per maund lower.

“The following additional factors have to be taken into account in fixing prices:—

- (i) unduly low production in Sambhar during 1952-53;
- (ii) the increase in the royalty payable to the Rajasthan Government if the issue prices are increased.

(i) *Unduly Low Production in Sambhar during 1952-53*

"The production in 1952-53 in the case of Sambhar is expected to be only 50 lakh maunds of salt against 94 lakh maunds in 1950-51, and the normal production estimated at 80 lakh maunds. This low production is an abnormal feature of this year occasioned by the failure of the monsoon in this area, and is not expected to repeat itself. The actual cost for 1952-53 is estimated at Re. 0/11/10·4 per maund against the actual cost in 1951-52 of Re. 0/7/2·4 and the estimated cost of Re. 0/8/5·8. This extra cost during 1952-53 will therefore have to be recovered in the future prices, and it is suggested that this recovery should be spread over three years so as to distribute the burden more evenly and avoid an immediate jump in the issue prices. The surcharge necessary to do so is calculated at 6 pies per maund on the sales of the Rajasthan Salt Sources as a whole.

(ii) *Increase in the Royalty Payable to the Rajasthan Government*

The agreement with the Rajasthan Government provides for the payment of a Royalty of 40% of the prices realised on the quantity sold in the Sambhar source subject to a fixed deduction of 17·25 lakh maunds of salt on which no royalty is payable. Thus if the issue price is increased for any reason, it results in an increase in the Royalty payable. In order to make provision for the payment of this royalty it has been estimated that an additional provision of one anna per maund is required in the case of Sambhar. The cost including return on capital, the surcharge and the provision for (i) increase in royalty and (ii) development charge of 0/1/6 per maund, *vide* Chapter III would be:—

	Rs. as. p.
Sambhar	0 11 6 per maund.
Pachbadra	0 11 6 per maund.
Didwana	0 9 6 per maund.

We recommend that these prices may be brought into effect forthwith.

"It has been calculated that the following prices will be just sufficient to recover the cost of production in the three Rajasthan Salt Sources:—

Sambhar and Pachbadra	Rs. 0 11 6 per maund.
Didwana	Rs. 0 9 6 per maund.

"*Kharaghoda*.—The price for this source has always been fixed independently of the Rajasthan Salt Sources. The cost for this source based on the estimated normal production of 48 lakh maunds, including development charge of 0/1/6 per maund, *vide* Chapter III, amounts to Re.-/12/- and the current price is Re. 0/10/6. We, therefore, suggest that the revised selling price for this source should be 0/12/0 per maund.

"*Despatch charges*.—In addition to the issue price of salt, the actual cost of despatch is also being charged to the purchasers at different rates in the Sambhar and Pachbadra Salt Sources. As these charges are based on actual cost and have been revised recently, we recommend that the existing rates may continue for the present.

“Review of prices.—It is desirable to maintain the prices of salt without frequent changes and it is suggested that the rates proposed by this Committee be maintained at least for a period of three years to come. It would, however, be necessary that these prices should be reviewed every year and if it is found that the actual costs have increased or decreased substantially for any reason, the issue prices will have to be revised suitably. This review can most conveniently be done at the time when the final budget estimates are prepared (which is sometime in November or December). If it is properly done, the question of loss on sale of Government salt should not arise in future.”

C.—SELLING PRICE IN PRIVATE FACTORIES

It is a matter for serious consideration how far the selling prices of salt in India could be reduced. When the salt duty was abolished, the then Finance Minister stated that the prices of salt should be kept at the minimum. When the smaller works in different producing centres are combined into larger or co-operative units, efficient methods of manufacture are adopted, the works are more scientifically laid out and mechanical appliances wherever possible are introduced, appreciable reduction in the cost of manufacture can be expected and a better quality of salt produced. The growing consciousness amongst labour for a higher standard of living which in due course must lead to the payment of better wages and the provision for amenities and social welfare schemes like unemployment benefit, health insurance etc. the cost of salt is likely to increase. This can be balanced only, if the cost on other items is reduced by more efficient methods of production.

Comparative ex-works selling prices of salt in India and other countries

	Prices per maund (naked) in about 1946-1950
	Rs. a. p.
U.S.A. Rock salt	0 8 7
U.S.A. Solar salt	0 7 10
Salt in brine	0 1 8 (rock salt).
U. K. Dried	2 0 11 (0 11 9 in 1939).
Undried	1 15 9 (0 11 0 in 1939).
<i>Indian Inland Sources—</i>	
Sambhar	0 9 9 (including cess at rate of Re. -/3/6 per maund).
Kharaghoda	0 12 6 (Ditto)
Mandi (Rock salt)	2 0 0 (excluding cess).
<i>Indian Marine Sources—</i>	
Saurashtra and Kutch	1 1 0 (Ditto)
Bombay	1 11 0
Travancore	1 4 0
Madras	1 2 5
Orissa	0 12 0

including cess at -/2/-per
md.

As compared with U. S. A. and U. K. the wholesale price of Indian salt for domestic consumption is not high; its quality is however poor; the American and U. K. salt is 99 per cent pure whereas the Indian salt averages only 94-95%. In U. K. and U.S.A. the industrial consumers have a great advantage inasmuch as they are able to get in brine of good quality at low cost from their rock salt mines. The Indian industrial consumers do not enjoy this advantage as the bulk of our salt is produced by solar evaporation and its quality is inferior. For chemical industries, the salt produced has to be refined further, which adds to the cost of the raw material for the manufacturers. Unfortunately in view of small deposits of rock salt and that also in a comparatively inaccessible areas, the Indian industries cannot hope to get salt in brine at a low cost but they have a right to expect that solar salt of the highest chemical purity will be manufactured in the country so that their cost of purification may be brought down.

D.—MEASURES TO REDUCE COST OF PRODUCTION

It is possible to produce salt in India at a lower cost by (a) consolidating the small uneconomic holdings into large compact block of production and (b) mechanising the processes as far as possible. In an information circular published by the Government of United States of America in 1939, it was observed:

“bringing salt by solar evaporation of sea would require large acreages, not only near the source of supply but also near consuming centres, and must be done on a large scale to be profitable. For these reasons a number of small producers in some localities have consolidated into one company.”

Both in the interest of the chemical industry and the general consumer, India must follow the example of U. S. A. and consolidate its production by re-organising the small licensees into economic units. Unless this is done, the price and quality of salt in India will continue to be a serious handicap to the industry.

CHAPTER XXII

SALTPETRE AND ALLIED INDUSTRIES

Saltpetre and salt are very intimately connected and saltpetre has had such a tremendous influence on the salt policy of the Government that it appears necessary that a chapter should be devoted to the saltpetre industry, its history and development in India. Before passing on to its history, it will not be out of place to notice a few common properties and uses of saltpetre.

A.—PROPERTIES AND USES OF SALTPETRE

Properties.—Saltpetre, nitre and potassium nitrate, called “Kalmi Shora” are all one and the same substance. This salt is formed by the combination of nitric acid with the base potassium. Its solubility greatly increases with heat. Hundred parts of water at ordinary temperature dissolve 30 parts of nitre, but at boiling point they dissolve about 200 parts. Thus if 200 parts of saltpetre and 37 parts of salt are dissolved in 100 parts of boiling water and allowed to cool, 170 parts of saltpetre and one part of salt will crystallize out leaving 30 parts of saltpetre and 36 parts of salt in the residual solution which is mother liquor “tor” or “Kahi” used by all refiners for the production of refined saltpetre and the separation of salt from crude saltpetre. Saltpetre has a peculiar saline bitter taste. Its specific gravity is 1.93.

Formation.—Saltpetre forms both from potassium salts of marine origin and from the potash of granite or gneissic rocks. These rocks generally get decomposed by the action of wind, rain, rivers, etc., called “weathering” into a loose powdery soil. Potassium is then derived from this powder and is converted into saltpetre by nitrification—a process by which the atmospheric nitric acid and ammonia act on potassium salts and convert them into saltpetre. Ammonia is generally formed by the decomposition of all kinds of animal refuse and is always present in the air. Plants convert the potassium into potassium carbonate and on decay again give rise to saltpetre. Nitre cannot deposit at a lower temperature than 60° F. and so natural saltpetre deposits are confined to warm latitudes. Their presence is limited to places in which felspathic rocks or marine deposits afford a plentiful supply of potassium. Necessary conditions for the formation of saltpetre are (1) supply of nitrogenous organic matter, (2) climatic conditions favourable for converting urea and ammonia into nitrous and nitric acid, (3) the presence of potash, and (4) meteorological conditions suitable for the efflorescence of nitre at the surface. In States like Bihar and Orissa we have ideal conditions for the formation of saltpetre. The large quantities of animal and vegetable refuse gathered round the agricultural villages of Bihar are decomposed into ammonia and other nitrogenous substances. These are acted upon by certain kinds of bacteria (nitrifying bacteria) in the damp hot weather with the result that at first nitrous and then nitric acid is produced in the soil. This nitric acid readily acts upon the salts of potassium with which the soil of the villages is impregnated on account of the large quantities of wood and dung ashes constantly being heaped up by villagers around their habitations. The nitrate of potassium thus produced is dissolved by rain water and accumulated in the sub-soil from

which the salt reascends to the surface by capillary attraction in the period of desiccation following the rainy weather. Large quantities of nitre are thus left as a saline efflorescence on the surface of the soil along with some other salts, such as sodium chloride or sodium carbonate.

Occurrence.—It is found widely spread in nature as a surface deposit mixed with earth and other salts. It is found over a great part of North-West Provinces and of Southern India, in China, Persia, Egypt, Spain, Chile and Peru. It is brought to the surface of the ground by moisture drawn to the surface by capillary attraction and is left there as an efflorescence on evaporation. It is seldom found pure and is generally mixed with other salts. In Uttar Pradesh and Madras it is found mixed with common salt.

Uses.—The most important use to which nitre has been put for a long time is the manufacture of gun powder. It is also extensively used in the preparation of fireworks. For its antiseptic powers, it is used to preserve meat and fish. It is used for freezing mixtures. It has a sedative action on the heart and is useful for checking inflammations and is consequently used in medicine. It is also used as a flux in glass making and as a mordant especially in wool dyeing; is used in association with certain animal dyes such as lac and cochineal. And lastly being a valuable fertilizer, it is used as manure especially for wheat and tobacco.

B.—HISTORICAL

In India saltpetre has been known to exist for ages. Crude saltpetre was formed from saline earth or efflorescence occurring in Uttar Pradesh, the Punjab, Bihar and Madras and its manufacture has been the hereditary occupation of a class of people called "Lunias" for centuries. Salt comes out as a by-product in the manufacture of saltpetre and so Government adopted a system of licences for its manufacture in order to protect salt revenue when salt was excised.

(i) *Uttar Pradesh.*—The Doab districts were ceded to the East India Company by the Nawab Wazir of Oudh in 1801. The Company created the salt monopoly and prohibited the manufacture of salt within the Customs Line. The manufacture of saltpetre remained unfettered for some time. Soon, however, the Company realized that the salt educed in the process of manufacture was a great danger to the salt revenue and so laid restrictions on saltpetre manufacture. The manufacture of alimentary earth salt in the North-West Provinces and in parts east of the Jumna was prohibited in 1834, but the Act had no power to control the production of salt in saltpetre works. However, the purification of this salt was declared an offence. By Act XXXVI of 1855 the purification and refinement of impure salt obtained in the manufacture of saltpetre so as to produce alimentary salt was declared to be manufacture of salt and was prohibited by law. The Customs and Revenue officials were empowered to search houses and enclosed places for contraband earth and saltpetre salt. Saltpetre salt which was not purified, however, could be sold without any restrictions and large quantities of this stuff passed into consumption. Saltpetre factories were established in the localities where salt percentage was excessive; the Lunia whose salt works had been suppressed made salt under guise of saltpetre. This was a menace to the salt revenue and so by Act XXXVI of 1861 the saltpetre industry was brought under closer control. The manufacture and refinement of saltpetre was only permitted under licences which were issued on payment of fees. The separation of salt by crude saltpetre workers was prohibited and salt educed by refiners was made liable to full duty in force. The manufacture of Khari,

rassi and *sajji* without a licence was also prohibited. A Deputy Commissioner and Circle Inspectors (officers of the Inland Customs Department), were charged with the duty of supervising crude saltpetre works, refineries, *rassi* and *sajji* factories and the Internal Branch was constituted. Saltpetre salt was excised and saltpetre factories were supervised. In Uttar Pradesh alone there were 17 circles with as many officers and 1,260 subordinate officials and men, all employed on preventive duty. The provisions of the Act were incorporated in the Indian Salt Act of 1882. From 1861 to 1885 in the then North-West Provinces and Oudh and Bihar, on a saltpetre refinery being opened, a Government official called "Mushriff" was appointed. He watched and recorded all refinery operations. He was then dispensed with and licensees were made responsible for everything. The Internal Branch was re-organized in 1923-24 and again in 1929-1931, i.e., radical changes were made in the licensing system, which will be described later on.

(ii) *Bengal and Bihar*.—In olden days there were no restrictions on the manufacture of saltpetre which went on extensively in Bihar. The Act of 1861 was extended to Bihar in 1873. The Government of Bengal, however, did not accept the agency of the Inland Customs Department in order to enforce the provisions of the Act, but appointed their own establishment under District Officers. This arrangement was not found satisfactory and so in 1880 the jurisdiction of the Internal Branch was extended to Bihar. In 1889-90 Mr. Ashton of the N. I. Salt Revenue Department was deputed to report on the saltpetre industry of Bengal and Bihar and it was found necessary to have a greater control over manufacture and refinement of saltpetre. Hence in 1890 the saltpetre refineries of the Bhagalpur Division of Bihar and those around Calcutta were brought under the N. I. Salt Revenue Department. The Calcutta refiners were deprived of the profits on salt which they made by selling salt educed in the manufacture of saltpetre and so gradually gave up the work and the industry declined. The control of the saltpetre refineries in Calcutta and its environs was transferred from the N. I. Salt Revenue Department to the Bengal Government in 1901 as Bengal had its own Salt Department. In 1925-26 there were only two refineries which produced 1,356 maunds of saltpetre. In 1932-33 there was only one refinery and that too in a moribund state. Only 13 maunds of refined saltpetre were produced in 1932-33. No licence was issued in 1933-34 or 1934-35.

As regards Bihar, the control of the saltpetre industry remained under the N. I. Salt Revenue Department. At one time the industry in Bihar was very flourishing. In 1892-93, 38,497, licences were issued for saltpetre works in Bihar, in 1923-24 the number fell to 17,416, in 1930-31 to 3,372 in 1936-37 there were only 100 refineries and at present there are only about 80 refineries in Bihar.

(iii) *Punjab and Rajasthan*.—About 1870 when the Inland Customs Department was at its zenith, the Salt Revenue of the Punjab was under the Punjab Government. The manufacture of earth salt in the trans-Indus portions of the Punjab was prohibited in 1881. In the Rajanpur Sub-Division of Dera Ghazi Khan district (now in Pakistan), earth salt was manufactured on a considerable scale under a contract system. In 1889-90 at the request of the Punjab Government, Mr. Buckley, Superintendent, Northern India Salt Revenue, was deputed to report on the saltpetre industry in the Punjab. According to him 1,48,000 maunds of crude saltpetre and 56,000 maunds of refined saltpetre were annually produced in the Punjab and on his recommendation the jurisdiction of the Internal Branch

was extended to the Punjab. The Department undertook the supervision of saltpetre manufacture and the suppression of manufacture of earth salt especially in the Rajanpur Sub-Division, where illicit manufacture was much prevalent. The supervision was not so close as in U. P. and Bihar since the eduction of salt in saltpetre factories was not so frequently resorted to. In 1890-91 the jurisdiction was further extended to Ajmer-Merwara in Rajputana where the location of a small establishment for the prevention of earth salt manufacture was found necessary.

When the abolition of the Inland Customs Line was under contemplation, treaties were negotiated with most of the rulers of the native states. The terms of the treaties, among other things, provided for the suppression of scattered earth salt manufacture and for a check over saltpetre works, especially those which were capable of producing very large quantities of salt.

(iv) *Madras*.—The saltpetre industry in Madras is as old as in Northern India. For years the manufacture of saltpetre was free from restraint or regulations. In the course of this manufacture edible salt was produced as a by-product and was consumed by the poorer classes. The Madras Salt Commission of 1876 examined the question and came to the conclusion that unregulated manufacture of saltpetre was inimical to salt revenue, as some works outwardly meant for saltpetre manufactured salt. It was with the passing of the Indian Salt Act, 1882, that the saltpetre industry was brought under control. A system of licence was introduced and persons guilty of illicit manufacture were liable to punishment. The licence fee for crude works and refineries was Rs. 2 and Rs. 3 respectively. About 1910 there were over a thousand crude works and refineries mostly in the Madura, Trichinopoly and Coimbatore districts, and 12,000 maunds of refined saltpetre were annually produced. An Amin (departmental petty officer) supervised each refinery. The industry, however, gradually declined and in 1924 the system of security bonds combined with supervision by the staff of the preventive circles was introduced and the special staff was abolished. From January 1927 the Northern India system was adopted under which a single licence was issued for the manufacture of both crude and refined saltpetre and the licensee was free to dispose of the educed salt as he liked. The licences since then were granted for the calendar year. A consolidated fee of Rs. 15 per factory or works was levied to cover the duty on the salt that might be educed during the extraction of saltpetre. The number of factories licensed for the manufacture of crude and refined saltpetre was 50 in 1931, but it fell to 40 in 1932 and to 37 in 1933. As a result of the Delhi Pact manufacture of crude saltpetre and small-scale manufacture of salt became free and the refineries alone were under supervision.

(v) *Bombay*.—There are no saltpetre works in Bombay

C.—INTERNAL BRANCH—DUTIES AND FUNCTIONS

The Northern India Salt Revenue Department through its Internal Branch and North-West Preventive Divisions controlled the saltpetre industry in the then North-West Frontier Province (now in Pakistan), the Punjab, United Provinces (Uttar Pradesh) and Bihar. The duties of the officers of these Divisions included the prevention of illicit manufacture of earth salt, supervision of eduction and disposal of salt and supervision of all licensed works in order to prevent the breaches of law

relating to the conditions of the licence and the arrest and prosecution of persons contravening the provisions of the Salt Act. Since 1880 the area under the jurisdiction of the Internal Branch was over 1,16,000 square miles extending over four provinces.

Prior to the Delhi Pact, crude saltpetre factories were inspected by the officers of the Internal Branch. Care was taken to see that no refined saltpetre or salt was produced and a saltpetre refinery did not work in the guise of a crude factory. In 1924 the crude saltpetre manufacturers were permitted to make refined saltpetre on payment of a higher licence fee. Licences for crude saltpetre, *rassi* and *sajji*, were however, abolished since the Delhi Pact (1931). The crude works were inspected to see that privileges granted under the 'Pact' were not abused and that refinement of saltpetre was not carried on without a refinery licence. The saltpetre refineries were closely supervised. Refiners were expected to keep registers where all operations carried on from day to day were entered. The salt educed had to be kept in a bonded store house and regular accounts maintained. From 1924 to 1928, however, the refiner was free to dispose of his salt as he liked since he paid a consolidated licence fee, otherwise such salt had always been liable to duty.

Different practical tests were carried out by the officers of the Internal Branch to ascertain the quantity of salt and refined saltpetre in a given quantity of crude saltpetre. It will be out of place to give them in detail. Prior to 1931 certain localities, where the percentage of salt in salt earth was excessive, were proscribed and no licences were issued for the manufacture of saltpetre, *khari*, *rassi* or *sajji* in those localities.

D.—MANUFACTURE OF CRUDE AND REFINED SALTPETRE.

The manufacture of crude saltpetre begins in Uttar Pradesh in January and in Bihar in February. If the weather remains favourable, the works increase with warmer weather when the soil becomes richer. The work reaches its zenith during May and June. In Uttar Pradesh and Bihar mostly artificial heat is used, but in the Punjab where rainfall is low, solar heat. The manufacturers begin their operations by scraping the surface from old mud heaps, mud walls, the lanes and walls of villages and towns, and from waste places where the saltpetre appears in the form of a thin white efflorescence. The material so obtained is filtered in large clay-lined mud filters provided with a bottom of bamboos, resting on bricks and leaving a space below for brine. Over bamboos a grass mat is laid and over the mat a thin layer of vegetable ash upon which the earth to be filtered is spread. Water is poured gently, which passing through the earth dissolves the saline matter and is carried to a receiver. This brine from the receiver is placed in a boiler and heated. It is then removed to earthen vats in which a sediment settles. The clear brine is then put back in the boiler and boiled; while boiling, salt deposits at the bottom of the boiler and is removed. When the crystallizing point is reached, the liquid is poured into earthen vats and is allowed to remain till the sediment is deposited. The liquid is then finally transferred to crystallizing vats where saltpetre crystallizes out in a refined state in about 24 hours. After extraction from the vats the saltpetre is washed to free it from the mother liquor called 'Tor' and it then becomes perfectly white. This saltpetre is called 'kuthia'. Refined saltpetre can also be made from crude saltpetre by dissolving it in water or strong brine and removing impurities by sedimentation. Salt can also be

obtained by boiling down the mother liquor which remains in the vats after the crystals of saltpetre have been removed. If a saltpetre manufacturer does not wish to refine his saltpetre, he simply boils the brine produced from filter to a crystallizing point. When this point is reached, he pours the liquid into the crystallizing vats where crude saltpetre is formed. Before the crystallizing point is reached, *sitta* or impure salt deposits.

The manufacture of saltpetre essentially varies with the salts with which it is combined. In Southern India, the first stage is the manufacture of common salt from salt earth and the second stage is the manufacture of saltpetre. The crystallization of common salt is continued, until the needle crystals of saltpetre appear. The mother liquor is then run off and recrystallized for saltpetre. Cold assists the saltpetre formation and so saltpetre easily crystallizes out at night.

E.—SUPERVISION OF KHARI, RASSI AND SAJJI FACTORIES

Prior to 1931, factories in which khari or sulphate of soda was manufactured by solar heat were closely supervised, since salt could be easily educed in the process of manufacture. Khari is prepared by a process very similar to that by which crude saltpetre is produced. The quality of earth collected is, of course, different in each case, but the filters, boilers and pans employed are much the same. For evaporation and condensation of the brine, boilers and pans are both used, the former in Bihar and the latter in Uttar Pradesh since in Uttar Pradesh there is a longer dry weather and in Bihar the soil contains only a small percentage of salt. Patna khari, the commercial name of Bihar khari, is produced by lixiviation of soda sulph efflorescence and its evaporation by artificial heat in iron boilers. It is used chiefly for preserving hides and skins, as a manure for potato and paddy crops and also as a cathartic for cattle. Bihar khari contains very little sodium chloride, but the khari produced up-country by solar evaporation contains a considerable percentage of it.

The *rassi* and *sajji* factories too were licensed prior to 1931. The manufacture of salt as a by-product was not possible in those factories, but the factories were similar to that of khari and hence the need for close supervision. If they were not licensed, a man could start manufacturing khari and educing salt under guise of manufacturing *rassi*. *Sajji* is also manufactured by artificial heat in boilers formed of earthen slabs from the lixiviation of soda-carbonate efflorescence. *Rassi* and *sajji* are greyish in colour and have soapy touch. They are used by dyers and soap makers and also by tobaccoists.

F.—DEVELOPMENT AND ULTIMATE DECLINE

The saltpetre industry flourished in India up to 1917-18. It began to decline rapidly after the Armistice in 1918. The rise and decline of this industry forms an interesting study. It was carried on by two classes of people (1) The village Lunia whose occupation it had been from times immemorial and (2) the refiner who refined the crude saltpetre produced by the Lunia. The refiner paid a big fee and prepared refined saltpetre within high walled enclosures and the salt educed by him was not allowed to leave the premises in duty days until it had been excised.

The table below will show the figures of total licences issued for all saline substances, the quantity of crude saltpetre dissolved and that of refined saltpetre produced and exported from Calcutta in some typical years. Figures from 1924 to 1928 when there were no restrictions on manufacture are not available.

Northern India

(a) Year	Number of licences	Crude saltpetre dissolved	Refined saltpetre produced	Exports of saltpetre
		Mds.	Mds.	Mds.
1877-78	9,152	1,97,951	1,08,617	5,29,474
1890-91	47,521	11,38,474	7,75,438	5,49,399
1900-1901	49,165	8,61,533	4,79,651	4,67,214
1909-10	48,266	8,58,150	4,80,150	4,85,447
1915-16	51,805	13,33,524	6,08,524	4,92,887
1920-21	47,071	11,31,674	4,46,883	17,191
1923-24	37,481	5,84,426	2,07,761	7,721 Tons
1929-30	20,034	3,90,444	1,41,179	4,228
1930-31	15,671	5,04,197	1,84,358	3,963
1931-32	3,907	5,10,628	1,94,272	6,609
1932-33	180	6,13,229	2,17,990	7,870
1933-34	192	9,14,346	2,59,600	9,360
1934-35	193	9,14,697	2,55,121	8,862
1935-36	207	8,50,755	2,97,795	9,051
1936-37	174	7,67,721	2,88,354	8,878
1937-38	166	5,70,475	2,11,648	8,434
1938-39	164	*6,74,768	*2,41,350	7,681
1939-40	74	8,75,011	2,90,219	8,415
1940-41	72	10,30,943	3,09,644	1,503

*Excludes figures relating to Central Division.

During recent years the industry is in a moribund state as the saltpetre market is very dull. Some refineries are, however, working, but statistics of saltpetre refined, its export etc. are not available.

The following table gives the number of individual licences issued in some typical years from 1880 to 1942:

(b) Year	Refineries	Crude salt-petre	Khari	Rassi	Sajji
1880-81	572	28,617	11,444	400	1,012
1890-91	526	42,540	3,931	166	358
1900-1901	455	39,771	7,800	239	900
1909-10	338	34,585	12,390	397	556
1920-21	397	34,715	5,620	14	325
1925-26	..	13,296	12,633	95	319
1930-31	154	6,571	8,678	32	390
1931-32	148	*..	1,846	1	298
1932-33	180	..	..	..	..
1933-34	192	..	..	..	..
1934-35	193	..	..	..	..
1935-36	207	..	..	..	..
1936-37	174	..	..	..	..
1937-38	166	..	..	..	..
1938-39	164	..	..	..	..
1939-40	74	..	..	..	..
1940-41	72	..	..	..	..
1941-42	80	..	..	..	..

* With the removal of restrictions on manufacture of khari, rassi and sajji, the latter figures are not available.

Madras

Year	Crude saltpetre factories	Refineries	Refined saltpetre produced
			Mds.
1892-93	1,815	40	16,126
1911-12	1,074	34	12,000
1915-16	885	26	6,590
1920-21	621	21	4,765
1921-22	625	28	3,691
1922-23	551	22	3,881
1923-24	369	31	3,756
1924-25	304	14	3,056
1925-26	123	7	2,411
1927 (Calendar year)	81 (Combined licences).	..	913
1928	do.	do.	1,220
1929	do.	do.	596
1930	do.	do.	585
1931	do.	do.	No information.
1932	do.	do.	Do.
1933	do.	do.	Do.
1934	do.	do.	Do.
1935	do.	do.	Do.
1936	do.	do.	Do.
1937	do.	do.	Do.
1938	do.	do.	Do.
1939	do.	9	Do.

The quantity of salt educed during the course of refinement of saltpetre in all the refineries in Northern India (U. P., Bihar, Punjab, etc.) varied from 50,000 to about 1,00,000 maunds per annum.

For long the trade was carried on as a monopoly by the East India Company. For over a century the Company were under obligation to supply to the British Government saltpetre to the extent of 500 tons annually, before being allowed to offer any for public sale. The trade in saltpetre has always been subject to extreme fluctuations. Up to 1860 India enjoyed a monopoly in the saltpetre trade. The exports in 1859 were 35,000 tons or about 10 lakhs of maunds. The Indian industry solely depended on foreign markets. The chief customers were the United States of America, the United Kingdom, China and Mauritius. After 1860 the manufacture of saltpetre from nitrate deposits of America and German potash began to affect exports from India which started declining. In 1867-68 India exported 4,49,147 maunds of refined saltpetre valued at £2,56,301. The average quantity exported from 1878 to 1883 was 4,05,568 cwts. a year. From 1897 to 1903 the average annual exports amounted to 3,82,353 cwts. valued at £2,62,592. On an average India exported 5 to 6 lakhs of maunds annually up to 1914, when the first World War broke out and there was a great demand for saltpetre from Great Britain and America for ammunition purposes. Moreover, potash was not available from Strassfurt mines of Germany and so India became the chief market and refiners expanded their works. The Government of India provided new facilities in 1915-16 by reducing the licence fees, opening the proscribed localities and introducing the system of issue of licences through the post offices—a system which ultimately became very popular. The exports in 1916-17 rose to 26,400 tons or about 8 lakhs of maunds valued at £7,03,690. The Armistice in 1918, however, suddenly stopped all demand for saltpetre and after the boom the great slump set in.

Besides this the market was captured by cheaper natural products and the development of nitrates by scientific processes started. Moreover, during and after the first World War, there was a sudden rise in the price of plant and in railway freight. Also the local product used for manurial purposes began to be replaced by Chile nitrate and imported chemical manures which sold at a cheaper rate. The avarice of the landlords in regard to the rent of nitrous soils and the tyranny of the middleman also accounted for the decline of the industry. All these causes combined to bring the industry to a state of acute depression and brought about a serious fall in exports.

G.—REVIVAL MEASURES—SCOTT O'CONNOR SCHEME

The Internal Branch was reorganized in 1924, the reorganization scheme being formulated by Mr. Scott O'Connor, Deputy Commissioner, Northern India Salt Revenue, with the object of assisting the decaying saltpetre industry by the removal of restrictions which hampered its activities. The change was brought into effect from 1st August 1924.

Before the introduction of this scheme, the manufacturer of crude saltpetre was prevented absolutely by the terms of his licence from educating any salt whatsoever. The refiners purchased the crude article and were required either to destroy or to have excised by officers of the Department, all the salt which in the process of refinement accumulated in their factories. Under the revised system a licence to manufacture saltpetre was granted without any distinction between crude and refined

product and any person in possession of such a licence was allowed to carry his process as far as he chose and educe without hindrance and dispose, as he pleased, of as much salt as he could. This was done to help the 'Lunia', the manufacturer of crude saltpetre. To cover the loss of revenue on salt formerly excised from refineries, the scale of fees was enhanced in Bihar from four annas to rupees two and elsewhere from rupees two to sums varying from rupees ten to rupees fifty according to the salinity of the soil in various districts and the method of manufacture employed. The fee was payable per factory and the area of filters, boilers or pans constituting a single factory was prescribed separately for the two systems of manufacture by solar and artificial heat. The manufacture of khari, rassi and sajji was similarly licensed, the licence fee for rassi and sajji being fixed at Rs. 2 and for khari Rs. 2 in case of manufacture by artificial heat and Rs. 10 in case of works working with solar heat.

The Scott O'Connor scheme resulted in a reduction of the Internal Branch establishment, but failed in its primary object which was to benefit the Lunia and to revive the decaying saltpetre industry. The Lunia took no advantage of the facilities offered. He was too slow and worked on too small a scale either to find buyers himself or to co-operate with others to get buyers for any refined saltpetre he might produce and was thus driven back to the refiner to whom he sold his crude product. The refiner continued to gain, since some share of his fees, as it were, was transferred to the poor 'Lunia'. The decrease in demand also crippled the industry.

(i) 1928-29 Revised Scheme.—The Scott O'Connor scheme proved inequitable and oppressive to the poor 'Lunia' as explained above and it was accordingly decided to revert to the old system, and place the burden on the proper shoulders. So a revised scheme approaching the system in force prior to the Scott O'Connor scheme and having as its main features low rates of licence fees for crude saltpetre, khari, rassi and sajji works, with higher rates of licence fees for saltpetre refineries and the excising of salt educed therein, was sanctioned by the Government of India. The scheme provided for the issue of licences through the post office and was put into force from 1st August 1929. According to this system, a distinction was once again drawn between the refiners and the crude saltpetre manufacturers. The former were subject to a high fee and payment of duty on such salt as they might produce and the latter were given licences on nominal rates of fees. Moreover, the Rs. 2 licence under which a Lunia could educe salt and dispose it of as he pleased was also kept as a special feature of the altered scheme. However, very little advantage was taken of this provision by the Lunia who was precluded by high railway freights, his lack of capital and of business training from access to more distant markets and was entirely dependent on the refiner. This system remained in force for about three years only.

(ii) Delhi Pact, 1931.—Under this agreement villagers were permitted to manufacture salt for their domestic consumption. So it was essential that the control exercised over the manufacture of crude saltpetre should be removed, since if salt could be manufactured without licence, it would have been unreasonable to demand licences in case of the less important substances like crude saltpetre, khari or rassi which would never have needed control but for the possibility of educing salt as a by-product of their manufacture. Accordingly the licensing system in respect of these substances was abolished from the 15th September 1931. Since then saltpetre refineries alone had to work under licence.

H.—PRESENT STATE

(i) *Northern India—(a) Up to 1947 (in duty days).*—The rise and ultimate decline of the saltpetre industry has already been traced. As mentioned above, the licences for crude saltpetre, *rassi* and *sajji* were abolished since the 15th September 1931. The refinement of saltpetre, could not, however, be resorted to without a refinery licence and refineries were under close supervision. The Lunia was free to manufacture crude saltpetre but was still entirely dependent on the refiner. He was not finding his avocation profitable and so gradually abandoned it and developed himself to agriculture or manual labour. Some of the Lunias, however, carried on the manufacture of salt under the Pact in some of the saline areas in the United Provinces (Uttar Pradesh). The Bihar saltpetre was very inferior and the Lunia found khari manufacture more profitable and took to that instead of saltpetre.

In the Punjab and the United Provinces (Uttar Pradesh) the fee for a licence to manufacture and refine saltpetre and educe salt therefrom is Rs. 50 and in Bihar Rs. 20. The duty was levied on salt and sitta (impure salt containing not more than 60 per cent sodium chloride) removed from saltpetre refineries in the Provinces of the Punjab, Bihar and U. P. at the rate of Re. 0-10-0 and Re. 0-1-3 per maund respectively including surcharge of 25 per cent. During 1935-36 there were 31 refineries in the Punjab, 59 in U.P. and 117 in Bihar. About eight or nine thousand tons (240,000 maunds) of refined saltpetre were annually exported from Calcutta and Karachi ports. About 80-90 thousand maunds of salt were produced and excised. The industry became in a depressed state and there was no hope of its revival.

(b) *After 1947 (after abolition of duty on salt).*—After the abolition of duty on salt in 1947, it was considered necessary to separate 'Salt' from the Central Excise and a new administrative organisation to administer the Salt came into existence in 1948 under the then Ministry of Industry and Supply. Till this separation, the Central Excise staff continued to license saltpetre refineries, but the refineries were free to dispose of the salt educed during the process, as there was no duty on salt. In 1949 it was proposed that as the duty on salt had been abolished and restrictions on the manufacture of salt on small sale had been removed, the issue of licenses for saltpetre refineries may also be made free. It was, however, considered that the license fee should be continued. So at present there is no control whatsoever on the saltpetre refineries, except that they have to take out a license and have to pay the prescribed license fee.

(ii) *Madras.*—The industry in Madras was also in a state of acute depression and during 1936-37 there were only 37 refineries producing about 400-500 maunds of saltpetre annually and about the same quantity of educed salt. The percentage of sodium chloride in educed salt was found to range from 82 to 93 per cent and the major quantity of the salt was reported to pass into human consumption, the balance being used for tanning and private fish curing. The salt issued for human consumption was subjected to a cleaning process, before it was offered for sale and it was ascertained from enquiries that it had no harmful effect on the consumers. The saltpetre industry was gradually declining owing to the very low margin of profit left to the Uppiliar or manufacturer after paying the licence fee and defraying other working expenses. Foreign saltpetre which was imported by sea and land sold at a much lower price, Rs. 65 to Rs. 75 per candy against Rs. 75 to Rs. 85 per candy for the local product and was preferred

by the dealers as being more suitable for fire-works and blasting purposes on account of its dryness. Even in spite of a reduction in the wholesale price of the local product, the industry continued to decline year after year. The question of reviving the industry by reverting to the old system of levying two different licence fees for crude saltpetre factories and refineries and controlling the issue of educed salt for consumption was examined in 1931 and it was decided that the expenditure on account of the establishment required to supervise the working of the refineries was prohibitive. The industry formed only a part-time occupation for poor people of the Uppiliar class who sold the crude saltpetre manufactured by them to the refineries for ultimate disposal. In view of the great slump in the industry and to encourage the refiners to continue with their avocation, the Government of India decided in 1944 to issue the licences without charging any fee in Madras. The position was reviewed year after year and this concession is continuing uptil now. The number of refineries in Madras is, however, negligible.

I.—HISTORY OF ADMINISTRATION

It has been seen in the "Historical" section of this chapter how the saltpetre industry in U. P. was brought under control in 1861, how the Internal Branch was constituted and how its jurisdiction was extended to Bengal, Bihar and the Punjab. The Internal Branch formed one of the four Divisions of the Northern India Salt Revenue Department under an Assistant Commissioner. Prior to the Scott O'Connor Scheme there were two Assistant Commissioner's Divisions comprising 9 circles, each under a Superintendent, and the saltpetre industry was under very strict control. With the introduction of the Scott O'Connor Scheme in 1924-25, a single Division under an Assistant Commissioner was created with only five circles. Superintendents were in charge of three of these and were stationed at Agra, Rai Bareli and Muzaffarpur. Inspectors were in charge of the other two circles, viz., Punjab and Rajanpur. The relaxation of control in 1931 led to some reshuffling of territorial charges and the reduction of one Superintendent and 4 Inspectors. The Division was put under an Assistant Commissioner with his headquarters at Agra. There were two Superintendents stationed at Allahabad and Kanpur under him. The subordinate establishment consisted of Inspectors, Jamadars, peons, etc. The Assistant Commissioner, Superintendents and Inspectors paid visits to the licensed works. They visited and examined large saline tracts, unlicensed crude, khari, *rassi* and *sajji* works in order to see that privileges granted under the Delhi Pact were not abused and that refinement of saltpetre was not carried on without a refinery licence. They also inspected the factories etc., of concessionaire firms who were allowed rebate of duty on salt used for industrial purposes.

Up to 1st April 1935 the jurisdiction of the Internal Branch extended to the North-West Frontier Province, the Punjab, U. P. and Bihar. From 1st April 1935 the North-West Frontier Province and 19 districts of the Punjab were transferred to the control of officers of the North-West Preventive Division, Kohat. The remaining districts of the Punjab, viz., Gurgaon, Delhi, Rohtak, Karnal, Ambala, Ludhiana, Jullundur, Hissar and Hoshiarpur, the United Provinces of Agra and Oudh (now Uttar Pradesh), the Central Provinces (now Madhya Pradesh), Central India (now Madhya Bharat) and Bihar constituted the Internal Branch and were under the Assistant Commissioner, Agra.

In 1938 and 1943 when more commodities were excised, there was a great reshuffling; the charge of the Commissioner was bifurcated and trifurcated and many new Divisions came into existence. The licensing and control of refineries was also brought under the charge of respective Collectorates and this continued till 1947 when the duty on salt was abolished.

On the abolition of duty on salt, Salt was separated from the Central Excise, and a new all-India Department with the Salt Commissioner as its Head and having his Headquarters at New Delhi was created by merging the Salt portions of the then existing Central Excise and Salt Department. The refineries are now under the charge of the Salt Commissioner and licenses are issued by him. So far as Madras is concerned, the power of issuing licenses has been delegated to the Deputy Salt Commissioner, Madras where, as already mentioned, no fee is being charged since 1944.

CHAPTER XXIII

INDUSTRIAL AND AGRICULTURAL SALT

A.—INDUSTRIAL USES OF SALT ARE SHOWN BELOW

I. As a chemical manufacturing agent—

- (a) Packing House Industry; salting beef, pork and mutton; hides and palts; butter and oleogarine; hams and sausage.
- (b) Ceramic industry; Glazes—dental cement; vitrifying washes; preventing shrinkage of clays.
- (c) Salting out product; separating soap; separating dyes; breaking industrial emulsions; separating organic preparations.
- (d) Metallurgical Industry; smelting ores; copper, silver, lead; hydrometallurgy of sulfide ores—copper, silver, lead; working steel; wire drawing; case hardening, working steel; plate rolling; heat treating.

II. As a Refrigeration Agent—

- (a) Ice manufacture;
- (b) Chemical works;
- (c) Cold storage; provision storage, Refrigerator cars; packing houses.
- (d) Ice-Cream manufacture.
- (e) Oil Refineries.

III. As Raw material for manufacture of chemical products—

(a) Electrolyte treatment:—

- (i) Chlorine; Sodium Hypochloride, Sodium Chloride, Calcium Hypochloride;
- (ii) Sodium;
- (iii) Hydrogen;
- (iv) Sodium Hydroxide;
- (v) Hydrochloric acid;

(b) Chemical treatment:—

- (i) *Le Blanc Process*:—Sodium Acid, Sulphate; Hydrochloric Acid, Sodium Sulphate.
- (ii) *Solvay Process*:—Sodium Carbonate; Sodium Bicarbonate.
- (iii) *Hargreaves Process*:—Sodium Sulphate; Hydrochloric acid.

IV. Miscellaneous—

- (a) Asbestos Cement;
- (b) *Preserving food*:—Curing fish; brine for pickles;
- (c) *Seasoning food*:—Bread, Pastries etc. Canned goods;
- (d) *Tanning*:—Mineral; Vegetable;
- (e) Salting wooden vessels;
- (f) Steaming in blasting:—
 - (i) Wood preserving;
 - (ii) Zeolite Water softening;
 - (iii) Soft abatement.

The present overall *per capita* consumption of salt is 200-lbs. in U.S.A., 100 lbs. in U. K. and the world's average is 40 lbs. against India's *per capita* consumption of 14-15 lbs. The low consumption in India is mainly on account of backwardness of the industries using salt as basic raw material, as caustic soda, soda ash and other heavy chemical industries. The needs of the Chemical industry form a large proportion of the industrial consumption of salt particularly in the manufacture of heavy chemicals, like soda ash, caustic soda, chlorine, sodium sulphate, etc. Soda ash (Sodium bicarbonate) is required largely in the manufacture of caustic soda, glass, textiles, paper, silicates, bichromates, etc. Caustic soda (Sodium hydroxide) is used extensively in soap making, in the rayon industry, in paper manufacture and in textile processing. Chlorine is used for sterilization of water; in the manufacture of synthetic resins for the plastic industry, and organic solvents for dry cleaning; in the production of bromine which is so important in the drug and dyestuff industries, chlorinated rubber, refrigerants, etc. In recent years, it has been found that *kutch* roads can be consolidated by the addition of salt to the clay used in surfacing. This gives the road a hard surface to withstand the damage caused by heavy traffic and inclement weather. New uses are being found for salt. For instance, a method is reported for using salt in ice to make thin ribbons of ice of an eutetic composition of 23.3 per cent salt and 76.7 per cent of water, with a melting point about 38° F. below that of ordinary ice. Two and a half pounds of ice are claimed to have the same refrigerating effect as one pound of solid carbon-dioxide or "dry ice". In the United States of America salt seasoning of timber is being studied and the results of tests obtained so far have been promising. Soaking green wood in an aqueous solution of common salt combined with sodium sulphate is reported to hasten the seasoning greatly and also overcomes cracking thus yielding usable timber from many trees hitherto deemed unsuitable for structural uses.

B.—INDUSTRIAL CONSUMPTION

In America and England, more than 70 per cent of the total salt produced is consumed in industries. As compared with this figure the industrial consumption in India is woefully small being only about 8 per cent. It indirectly indicates the backward state of the industries in India.

In U. S. A., of the various industries using salt, the chemical industry is the largest single consumer and accounts for 85 per cent of the industrial consumption as shown below:—

Consumption of salt by Different Industries in U.S.A. and India

	U.S.A.		India	
	Tons	Per cent	Tons	Per cent
Heavy chemical, Dyestuffs	84,42,000	83·85	1,40,000	73·68
Soaps	57,000	0·56	15,000	7·90
Other Chemicals	4,78,000	4·75	10,000	5·26
Miscellaneous	10,91,000	10·84	25,000	13·16
	1,00,68,000	100·00	1,90,000	100·00

(iv) In agriculture, salt is used as a fertilizer for certain classes of crops. Peas, potatoes, turnips and beet-roots improve in their quality and yield if salt is added to the manure. Salt is also found beneficial for fruit trees. Coconut palm which grows naturally in abundance on the sea coast requires manuring with salt when it is grown inland. The improvement that is noticed when salt is used as a fertilizer is also attributed to its property of releasing potash in the soil which might not be available otherwise to the plant. Thus salt forms a constituent of many fertilizers.

C.—CONSUMPTION BY LIVESTOCK

Since their diet is comparatively poorer in salt content than the ordinary human diet, livestock needs as much salt, if not more than human beings. At present no separate figure of consumption of salt in India by livestock is available, but according to a very rough estimation, the quantity may be about 8,16,000 Mds. (30,000 tons) per annum. It would be reasonable to assume that, like human beings, cattle living in the tropics need more salt than the cattle in cooler climates. Moreover, the Indian pasture is relatively poorer in mineral content and the greater deficiency of salt in the diet of our cattle has to be met by a larger intake of salt. To keep the livestock in good condition the Veterinary Research Stations in India calculate the average requirement of salt per head of cattle at about 38 lbs. and for goats and sheep at 10 lbs. per head per annum. If salt for our livestock is to be provided on the basis of figures recommended by the research stations, the total requirement would exceed 3·3 million tons (90·64 million mds.) per year which exceeds the present total consumption of the country of 2·5 million tons (675 lakh maunds). The American figure of *per capita* consumption for livestock comes to only about 9·7 lbs. per head of cattle; even on this basis our livestock would require about 1·12 million tons (305 lakh maunds) a year. Duty levied indiscriminately on all salt irrespective of its use for agricultural or industrial purposes could not be defended. So from the beginning of the salt monopoly, the Government of India provided facilities for the issue of salt free of duty and sometimes even of price for industrial purposes.

D.—CONSUMPTION BEFORE PARTITION

(a) Punjab and United Provinces (Now Uttar Pradesh)

In 1883-84 the Government of India first framed rules to grant concessions in respect of salt used for industrial purposes. Duty-free salt was then allowed to the N. W. Soap Company of Meerut. Subsequently there were about 125 firms engaged in various industries who enjoyed these concessions. The managers of the firms purchased salt in the open market and applied for refund of duty on salt actually consumed by them for industrial purposes every three months. They had to give detailed statements of their stock, quantity used, purchased and left in stock and a declaration that the salt had been used for industrial purposes only. The salt had to be kept in a strong room and regular accounts maintained in the proper form. The factories were open to inspection by the officers of the Northern India Salt Revenue Department and the firm was expected to provide all facilities. Applications for refund of duty up to 1st April, 1935 were dealt with by the Assistant Commissioner, Northern India Salt Revenue, Internal Branch, Agra. The number of firms allowed a rebate of duty on salt was 31 in 1931-32. It rose to 55 in 1932-33, to 86 in 1933-34 and to 125 in 1934-35. The total amount of duty refunded was Rs. 69,817 in 1930-31 and 1,59,175 in 1934-35. Messrs. Cooper Allen and Co., Kanpur, were paid the largest refund, i.e., Rs. 13,575-9-0. Out of 125 concessions, 80 concessions were for curing hides and skins, 8 for bleaching and dyeing, 15 for softening water, 3 for glazing pottery, one for steel plate manufacture, one for the cleaning guts, 1 for pickling hides and skins, 8 for manufacturing soap, one for refining oil, one for making pipes, 5 for manufacturing acid and one for tanning skins. Salt was also issued at concession rate to the refinery at Lahore (now in Pakistan). Dust or fine salt was separately stacked and issued to the concessionaire firms. The factories were periodically inspected by Salt Revenue Officers. The concessionaires were required to deposit an inspection fee of Rs. 100 per annum as provided under the Northern India Salt Revenue Rules.

As concessionaires began to abuse the concession, the Government of India in January 1935 imposed certain restrictions under which concessionaires were required to purchase salt educed in the manufacture of salt-petre locally from approved salt dealers only. In cases in which this kind of salt was not suitable for their needs, they were required to obtain through the Assistant Commissioner concerned special sanction from the Commissioner to use full-duty-paid salt. The duty was refunded half yearly instead of quarterly. In their application for refund of duty the concessionaires had to show:—

- (1) (i) the balance of salt in store at the beginning of the half year;
- (ii) the quantity of salt purchased during the half year;
- (iii) the quantity of salt used during the half year and the quantity on which a refund of duty was applied for;
- (iv) the balance of salt in store at the close of the half year;
- (v) the quantity, weight and such other details of products manufactured during the half year as may be required by the Assistant Commissioner;
- (vi) a declaration stating the product manufactured and the name and situation of the factory or works, and that the salt on which a refund of duty was applied for had been used *bona fide* by the applicant in the process of manufacture of such product and had not been used for any other purposes.

- (2) The particulars entered in accordance with clauses (i), (ii), (iii) and (iv) of sub-rule (1) did distinguish between salt on which duty had been paid, or was deemed to have been paid, at different rates.

The concessionaires were required to keep the salt in a securely constructed store room fitted with a strong door capable of being locked, and had to maintain regular accounts. The concessionaires in the C.P., Central India, United Provinces, Bihar and Orissa, Ajmer-Merwara and Delhi were under the charge of the Assistant Commissioner, Internal Branch, Agra. Up to 1st April, 1935 the Punjab and N.W. Frontier Province (now in Pakistan) too were under his charge. From 1st April, 1935 the Reorganisation Scheme—a scheme for the reorganisation of the superior establishment of the Northern India Salt Revenue Department involving the separation of the technical and administrative branches at Khewra (now in Pakistan), the creation of a separate mining section of the Department and a new Preventive Division in the North-West Frontier Province and the Punjab called the North-West Preventive Division came into force. The officers of the North-West Preventive Division had also to supervise the operation of the rules for the refund of duty on salt used for industrial purposes. So only 8 districts of the Punjab, viz., Ambala, Karnal, Ludhiana, Jullundur, Hissar, Hoshiarpur, Rohtak and Gurgaon were kept under the Assistant Commissioner, Internal Branch. 19 districts of the Punjab and the North-West Frontier Province were transferred to the jurisdiction of the officers of the North-West Preventive Division. 17 districts were being supervised by the Assistant Commissioner, North-West Preventive Circle, Khewra. The districts of the North-West Province and the districts of Attock and Rawalpindi in West Punjab were under the direct charge of the Assistant Commissioner, North-West Preventive Division, Kohat (now in Pakistan). About 1941 it was noticed that hide and skin curers were putting in false claims for refund by boosting up the figures of consumption of salt. So it was ordered that only denatured salt (salt mixed with naphthalene and a blue dye) only would be supplied to the hide and skin industry at the cost of production of salt plus the cost of denaturants, etc. The price fixed was Re. 0-9-0 per maund. No refunds were thenceforward allowed to this industry.

(b) *Bombay Presidency*

(i) *Industrial Salt.*—Since 1903 salt had been issued duty-free for industrial purposes such as dyeing, bleaching, tanning and manufacture of chemicals. Under the rules the firm enjoying the concession of duty-free salt was expected to keep a regular account of salt used by it. The salt had to be kept in a bonded or locked store which was open to inspection by salt officers. About 80,000 maunds of duty-free salt were annually issued to mills, tanneries and chemical works. Agreements were taken from factory or millowners who had to deposit Rs. 100 per annum as fee for meeting the expenses of inspection. Salt was also used as a drying agent in the acetone factory at Deolali. The owner used duty-paid salt at first and applied for refund of duty on salt actually used by him. From 1923 to 1935 quantities varying from 65,000 to 93,000 maunds were used for industrial purposes and from 1935 to 1946 from 1 to 2 lakh maunds per annum.

(ii) *Agricultural Salt.*—The Bombay Government sanctioned the issue of denatured salt for use in agriculture in 1914. Up till 1923-24 salt was denaturalized by mixing it with bone dust and crude oil in the proportion of 94 : 5 : 1. As the price of denaturants subsequently increased they were

used in half the above proportions—that is, $97 : 2 \frac{1}{2} : \frac{1}{2}$. Salt was issued at cost price plus the cost of denaturalisation. It was used as manure and was unfit for human consumption. The cost price of denatured salt was fixed by adding about 3 annas to the issue price at the fish curing yards. The agriculturist used to get a permit from the Agriculture Department and had to produce it before the Salt Department Officer who issued the quantity specified therein. Salt was issued from the store most convenient to the agriculturist. The quantities of denatured salt issued for agricultural purposes varied from 1,300 to 6,500 maunds between 1923 to 1935. It ranged between 5,500 to 7,500 maunds during 1936 to 1946.

(iii) *Fish curing*.—In the Bombay Presidency 34 fish-curing yards were established by the Salt Department on the sea coast at the important fishing centres from Boria in Ratnagiri district to Bhatkal in Kanara district. About 80,000 maunds of duty-free salt were issued to these yards every year. In the Northern Konkan and on the Gujarat coast all attempts to start fish-curing yards failed as fish was not salted in any large quantities in that locality, the people preferring it dried or sun-dried. Some fish merchants in the Thana and Surat districts were, however, granted the concession, on certain conditions, of using duty-free salt for curing catches of fish at sea made on the Kathiawar and Kutch Coasts. Only one merchant availed himself of this concession in 1933-34; he used 700 maunds of salt. The concession of using salt (on which duty was subsequently refunded) for curing and preserving fish at sea on the coasts of the Thana and Surat districts was not taken advantage of by any one during 1934-35.

In Ratnagiri and Kanara districts each fish-curing yard was in charge of a Karkun (Pay Rs. 30—80). The policy of Government was to make the fish-curing yards self-supporting and so detailed receipt and expenditure accounts were maintained. The Salt Department used to build sheds, fences, etc., for the yards; the total cost of maintaining the yards being about Rs. 70,000 per annum. Salt was supplied to the yards by contractors from the Uran factories at the rate of annas 9 for Ratnagiri district yards and at annas 10 for the Kanara yards. The issue price to the yards was Re. 0-14-0 per maund. From 1st October, 1933 it was raised to Re. 1 which prevailed up to 1937-38 and even after. The rate was fixed allowing for cost price, establishment and other charges, so that the yards worked at a small profit. At least 1,000 maunds per annum was required by a yard before sanction to open a new yard was accorded.

The yards were constructed near the sea beach. A yard was a salt store capable of holding a year's requirement and had a big compound where fish were cured by wet and dry processes. Fishermen used to bring fish split, cleaned and asserted; they were counted by the Karkun and weight was calculated. When salting was done by the wet process, one maund of salt was allowed for every three maunds of fish; and when by the dry process, one maund was allowed for every five maunds of fish. The Ratnagiri fishermen are industrious and enterprising and the fish curing was in their own hands. Unlike the Madras curers they did not rely on wealthy middlemen. In Kanara conditions were very similar to Malabar—that is—the fishermen being lazy and largely in the hands of outside financiers. The Madras fishery experts, who visited the Bombay yards reported very favourably on the methods of working and recommended their adoption in the Madras yards. In 1934-35 the total quantity of fish brought to be cured was 3,01,426 maunds and 78,924 maunds of salt were issued.

The control of the fish-curing yards was transferred to the Government of Bombay with effect from the 1st July, 1936.

(c) *Bengal*

The Government of Bengal issued similar rules providing for the issue of duty-free salt for industrial purposes. In the case of glazed stone-ware industry the salt was mixed with tar in the Government salt golas in the proportion of one seer of tar to one maund of salt and was then issued free of duty. Under Government of Bengal Finance Department (Separate Revenue) Notification No. 170 S.R. of the 5th March, 1935 denaturalisation of salt free of duty was also permitted for the manufacture of a preparation for the preserving and tanning of hides. Two lbs. of naphthalene powder and 1 lb. of sodium thiosulphate were ordinarily mixed with one maund of salt for the purpose of forming the mixture. In the case of soap, tanning, alkali and hydrochloric acid industries, salt was not issued duty-free, but a refund was allowed quarterly on the actual amount used. During 1932-33 and 1933-34 duty was refunded on 77,695 and 81,345 maunds of salt respectively.

There was no fish-curing yard in Bengal. In olden days (in 1875) a fish-curing yard was established at Goalundo (now in Pakistan), but it was closed in 1880, as the experiment did not prove a success.

(d) *Madras Presidency*

(i) *Industrial Salt*.—Under the rules first framed by the Government of India in 1884 for the issue of salt duty-free for use in other industrial manufacture, salt was required to be issued from the factory in sealed bags and was stacked in a secure store room, the key of which was in the custody of the manufacturer or the manager of the works. The bags were not allowed to be opened before the salt was actually required for use and the manufacturer had to maintain a correct account of receipts and issues. The accounts and the salt in store were open for inspection by any Magistrate or by any officer of Police not below the rank of an Inspector or by an officer of the Salt, Abkari and Customs Department not below the rank of Sub-Inspector. In 1899 it was considered necessary to supervise the issues of salt. Later, in 1901, an annual fee of Rs. 300 was levied to cover the cost of inspections and other departmental expenses. This fee was reduced to Rs. 100 in 1907 and in 1918 the employment of a Petty Officer was made optional. The rules were revised in 1927 and under the revised rules an applicant for supply of duty-free salt had to submit a separate application and pay the prescribed fee of Rs. 100 in respect of each of the factories or works for which the supply was required and also to execute a bond and agreement if the application was granted. Very little advantage was taken of the concessions of duty-free issues for manufacturing purposes before 1900, only 14 maunds being issued in 1886-87, 10 in 1887-88 and 10 in 1892-93. The demand for duty-free salt, however, gradually increased. The issues varied from 600 to 85,000 maunds between 1900 and 1935 and from 1,00,000 to 2,41,000 maunds between 1935 to 1946.

(ii) *Fish curing*.—Before the suppression of the use of salt-earth, the fishing classes were accustomed to cure with earth salt the fish which they could not sell fresh. To prevent the heavy loss entailed on the curers by the purchase of duty-paid salt and to obviate the injurious effect of the

supply of badly cured fish, it was decided in 1875-76 to supply salt duty-free at a little over cost price for curing fish at one place in each coast district. In subsequent years the operations were gradually extended. From 1st April 1924 the control of the fish curing yards was transferred to the Director of Fisheries working under the Madras Government. Since then, the Fisheries Department made its own arrangements to buy salt from the cheapest market, transport it to the yards and supply it to the curers and it bore the losses, if any, resulting from the transactions. The issue price of salt was fixed at a uniform rate of 6 annas a maund in 1874. From the next year, however, different rates were introduced for different areas varying from 6 annas a maund till 1917. The rate was made uniform at 10 annas a maund in 1918 and in 1924 when the Local Government took over the management of the yards, it was raised to Rs. 1-4-0 a maund in order to minimise the recurring losses on the working of the yards. Government agreed to supply salt required for distribution in the yards free of duty. Up to 1931-32 Government purchased one or two heaps from the Modified Excise licensees solely for supply to the Fisheries Department in instalments, but this entailed loss to Government in that wastage had to be borne by the Department. So in 1931-32 instructions were issued that the Fisheries Department should make its own arrangement for the purchase of salt from Excise licensees in factories where manufacture on behalf of Government was not carried on.

Salt required for distribution was then supplied by the Government of India free of duty. All the important fish-curing yards were on the West Coast and the salt required by those yards was transported from the Tuticorin Salt Factories. The issues of salt for fish-curing varied from 1,50,000 to 3,00,000 maunds between 1919 and 1935. From 1935 to 1940, the issues decreased very much and touched 1,89,000 maunds in 1937, they again rose from 1937 onward and ranged between 2,00,000 to 4,00,000 maunds between 1937 and 1946.

Mysore State.—The issue of duty-free salt to industrial concerns in Mysore State started in 1923. It was limited to 14,000 maunds. In 1931-32 the rules in force in the Madras Presidency for issue of duty-free salt for industrial purposes were amended so as to make them applicable to industrial concerns in Indian States for which the Government of India agreed to supply duty-free salt. The State was required to adopt sufficient safeguards in order to see that the concession was not abused. 10,948, 16,580, 19,044, 22,400 and 21,810 maunds were issued in 1930-31, 1931-32, 1932-33, 1933-34 and 1934-35 respectively. This salt was used for tanning hides and skins, bleaching cotton and silk goods and for soap factory at Bangalore.

It will not be out of place to point out that the Industrial Commission (1915) considered the arrangement of fish-curing yards in the Madras Presidency very satisfactory. They thought that there was an immense future before the Indian fisheries and recommended to Bombay and Burma to follow the example of Madras. The Indian Taxation Inquiry Committee (1926) recommended that the present concessions with regard to issue of salt for fish curing might be continued provided it did not result in any cost to the Government in excess of the duty remitted. The Committee suggested that the concessions should be extended to all other provinces as well. The Committee considered the system of issue of duty-free salt for textiles and other industries in various provinces satisfactory. As regards agriculture, they recommended the extension of the Bombay rules to other provinces.

E.—CONSUMPTION AFTER PARTITION

Soon after the abolition of salt duty, the country was partitioned and the Salt Department was separated from the Central Excise Department in November, 1947. As a result of this separation, the present Salt Organisation has no field staff in the consuming areas and as such there is practically no machinery through which statistics of supplies of salt made to industries, agriculture etc. from the trade in consuming areas, could be collected. Statistics of consumption of salt by cattle and agriculture are also not available since such supplies are also made direct through the trade in the consuming areas.

Below is a table showing supplies of salt made to different industries in the country direct from different salt sources immediately before partition and after partition:—

A. Rajasthan Salt Sources

(Figures in '000 mds.)

Year	Hides & Skin.	Appd. agents for small industries including Hides & Skin	Chemical industries	Refinery & Black salt	Misc. industries, as textile, water softening, ice factories etc.	Total
1946	..	..	..	Nil	..	233
1947	..	..	..	Nil	..	436
1948	11	302	..	3	151	467
1949	13	283	..	13	162	471
1950	7	315	..	22	219	563
1951	32	539	313	53	57	994
1952	31	445	312	195	43	1,026
1953	29	421	364	218	40	1,072
1954	485*	..	309	272	147	1,213

*including approved agents.

B. Madras Region

(in '000 mds.)

Year	Madras and Andhra State Source				Travancore and Cochin	Total Madras Region
	Fish curing	Hide curing	Chemical industries	Total	Fish curing	
1946	346	90	62	498	2	500
1947	378	59	90	527	0.2	527.2
1948	231	2	102	335	..	335
1949	139	1	85	225	..	225
1950	164	3	98	265	0.4	265.4
1951	274	16	182	472	0.7	472.7
1952	338	3	173	514	3.4	517.4
1953	109	9	204	322	25	547
1954	344	3	273+ 27(a)	647	33	680

(a) Other industries like soap, Textile, Paper etc.

C. Bombay Region

(in '000 mds.)

Year	Bombay State Source				Total	Saurashtra Source Chemical industries	Kutch Source Chemical industries	Total of Bombay Region
	Fish curing	Hide curing	Chemical industries	Other industries (Soap, Textile etc.)				
1946 . .		Not	available.					
1947 . .	..	20	6	84	110	..	..	110
1948 . .	..	31	21	412	464	..	..	464
1949 . .		Not	available					
1950 . .	(Not available)		1,708	337	2,045	773	..	2,818
1951 . .	58	25	1,990	273	2,346	879	..	3,225
1952 . .	72	45	1,931	264	2,312	737	..	3,049
1953 . .	70	81	2,324	314	2,789	917	..	3,706
1954 . .	62	44	2,181	342	2,629	337	562(a)	3,528

(a) Supplies made to Mithapur Chemical Works (Bombay) and Alwaye Chemical Works (Cochin).

D. Calcutta Region

Calcutta source including Orissa

(in '000 mds.)

Year	Fish and Hide curing					Total
	Fish curing	Hide curing	Chemical industries	Paper industries	Textile & other industries	
1946 . .	6.3	0.4	206.9	181.8	4.0	399.4
1947 . .	0.9	0.6	190.8	144.8	1.6	338.7
1948 . .	2.4	0.5	179.6	173.8	6.4	362.7
1949 . .	1.2	0.7	213.8	178.1	2.5	396.3
1950 . .	0.3	0.2	249.7	175.1	2.0	427.3
1951 . .	Not available.	2.1	272.5	198.3	2.8	475.7
1952 . .	"	0.7	259.5	208.0	1.6	469.8
1953 . .	"	1.0	333.1	207.3	1.2	542.6
1954 . .	"	..	204	118.0	..	322.0

The following table will indicate the percentage of industrial salt bears to total consumption in different Salt Regions:

Year	% of industrial salt to total consumption			
	R.S.S.	Madras	Bombay	Calcutta
1946	2.0	3.2	..	2.6
1947	3.3	2.5	0.8	2.3
1948	4.1	1.6	2.5	2.4
1949	4.2	1.2	..	2.7
1950	5.0	1.3	..	4.0
1951	8.7	2.5	12.9	4.0
1952	10.7	2.6	13.0	4.0
1953	13.7	1.9	12.7	4.0
1954	14.8	3.6	7.6	2.5

The percentage of consumption of industrial salt in the Rajasthan Region shows a sharp increase from 1951 mainly due to larger demand from the D. C. M. Chemical Works at Delhi and supply of salt to salt refining and Black salt industries. The higher percentage in case of Bombay Region is also due to gradual larger clearance of salt to caustic soda and other alkali industries at Mithapur in Bombay State, Dhrangadra Chemical Works at Dhrangadra in Saurashtra and Travancore-Cochin Chemical Ltd., Alwaye in Cochin.

The caustic soda and heavy chemical, paper and textile industries which are now indenting salt from the direct sources in different Salt Regions are mostly as follows:—

(a) R. S. S. Region—

- (i) *Delhi*.—M/s. D. C. M. Chemical Works, Delhi (for Caustic Soda).
- (ii) *Punjab*.—M/s. Shree Gopal Paper Mills, Jagadhri, Ambala (for Caustic Soda).
- (iii) *Bihar*.—M/s. Rohtas Industries, Shahbad, Patna (for Caustic Soda).

(b) Madras Region—

- (i) *Madras*.—M/s. Mettur Chemicals and Industries Ltd., Mettur, Salem.
- (ii) *Mysore*.—M/s. Bhadrawati Paper Mills, Bhadrawati (Paper Industries).
- (iii) *Cochin*.—M/s. Travancore Cochin Chemicals Ltd. Alwaye, Cochin (for Caustic Soda).

(c) *Bombay Region:—*(i) *Bombay.*—M/s. Tata Chemicals, Mithapur, Amreli (Caustic Soda and other heavy chemicals).

M/s. Calico Mills, Ahmedabad (Textile industries).

(ii) *Saurashtra.*—M/s. Dhrangadra Chemical Works, Dhrangadra (Soda Ash and other heavy chemicals).(iii) *Hyderabad.*—M/s. Sirpur Paper Mills, Sirpur, Kagaznagar (Paper Industries).(d) *Calcutta Region:—**West Bengal.*—(1) M/s. Titagarh Paper Mills, Titagarh, 24 Parganas (Paper Industries).

(2) Alkali Corporation Ltd., Hooghly (Caustic soda and other chemicals).

Hides and Skin Industries.—As a result of enforcement of quality control on salt, the Government of India ordered in 1953 that sub-standard salt should not be allowed to be sold for human consumption. Such salt should either be thrown back into the crystallising pans or it might be used for hide curing, soap and other industries which do not require high purity salt. At Didwana, owing to high percentage of sodium sulphate, the quality of salt is generally much below the standard. It was, therefore, decided that all hide and skin industries and approved agents who supply salt to soap, hide and skin and other small industries should be allotted quota of sub-standard salt only from Didwana. The Government of India also viewed that it should be ensured that such substandard salt did not go in for human consumption even from the traders in the consuming areas.

Offtake of salt for hide industries has gradually been declining mainly because of the embargo placed on exports of raw hides to foreign countries on account of shortage in raw hides in the country after Partition. The following statistics of exports of hides and skin indicate how the exports have been declining:

Export of Hides (Raw buffalo, cow and calf skin)

Year	Weight (Cwt.)	Nos.	Value (Rs. in '000)
1951-52	24,980	2,56,751	6,175
1952-53	1,380	10,050	232
1953-54	..	..	..

CHAPTER XXIV

RECOVERY OF BY-PRODUCTS

A.—GENERAL

India is one of the important salt producing countries of the world. Salt is manufactured, (a) from sea water in Bombay, Saurashtra, Madras, Travancore-Cochin, Andhra and Orissa; (b) from sub-soil brine in Kharaghoda and Saurashtra; and (c) from lakes in Rajasthan. As the composition of brine varies, the composition of bitterns also varies and so the by-products obtainable from all the three sources are somewhat different from each other. Besides sodium chloride, the major constituents of the dissolved solids in sea-water and the brines of Kharaghoda and Kuda are: calcium carbonate, calcium sulphate, potassium chloride, magnesium sulphate, magnesium chloride and magnesium bromide. Sea water also contains small quantities of iodide, fluorides, phosphates, nitrates and other salts of iron, silver, gold, copper, lead, arsenic, zinc, nickel, lithium, rubidium and caesium. These substances occur in extremely minute quantities and their recovery on a commercial scale is uneconomical. Numerous analyses of sea brine showing the percentage of dissolved salts in sea water have been made from time to time beginning with that of Lavoisier in 1772. However, the most well-known of these analyses was that made by Dittmar at the University of Edinburgh. The average of the analyses of the 77 samples carried out by him is given below:—

	Parts* per 1,000 parts of water.
Sodium chloride NaCl	27.213
Magnesium chloride MgCl_2	3.807
Magnesium sulphate MgSO_4	1.658
Calcium sulphate CaSO_4	1.260
Potassium sulphate K_2SO_4	0.863
Calcium carbonate CaCO_3	0.123
Magnesium bromide MgBr_2	0.076
TOTAL .	35.000

The major constituents of the lake brine at Sambhar Lake, however, are sodium chloride, sodium sulphate and sodium carbonate.

The major by-products of the salt industry are of considerable economic value. For example, gypsum is used in the manufacture of fertilizers and portland cement, and as paint and plaster material. In view of the scarcity of sulphur deposits in India, gypsum has attained importance as a raw material for the manufacture of sulphuric acid. The recovery of gypsum from all the salt producing centres in India has become a dire necessity; more so, as big gypsum producing areas in the Salt Range have gone to Pakistan.

Potassium chloride is one of the most important salts of potassium and is required in large quantities for manufacture of potassium chlorate and potassium dichromate. It is also required for use as a fertilizer. Magnesium chloride is used for sizing in the textile industry and for the preparation of magnesia cements. Magnesium sulphate is used in tanning and dyeing industries, in the manufacture of paints and in the finishing of cotton goods. It is used also for wetting paper, silk and leather. Bromine is used in organic synthesis and its compounds find application in photography and in the manufacture of sedative drugs, dyes and antiknock compounds. The importance of sodium carbonate need hardly be emphasised. Huge quantities of this chemical are consumed in the country. Sodium sulphate also is an important chemical used in paper mills and other industries. Experiments carried out in the National Chemical Laboratory, Poona, have shown that a mixed fertilizer with commercial possibilities can be prepared by ammoniating the sea bitters left over after the extraction of common salt.

Very little attention has been paid by salt manufacturers in India to the recovery of by-products. The recovery of gypsum has been attempted by some salt works, such as the Tata Chemicals at Mithapur, The Mettur Chemical and Industrial Corporation, in Madras, The United Salt Works and Industries, Kandla, The Digvijay Sinhji Salt Works, and The Halar Salt and Chemical Works, Jamnagar, etc. The table below gives the annual production in tons of by-products—gypsum and others at different places in India. The figures show that even in those salt works in which by-products are recovered, the bitters are not fully exploited; at Kharaghoda for example, only a quarter of the bitters is utilized and the rest goes to waste:

Recovery of By-products other than Gypsum

(Figures in tons)

Name of the by-product	Tata Chemicals, Mithapur	Pioneer Mag- nesia Works, Kharaghoda	Salt Work at Kuda
Magnesium sulphate	700	400	0
Magnesium chloride	3,000	3,000	635
Bromine	25	..	..
Potassium chloride	25	278	..

Recovery of Gypsum

(Figures in tons)

Name of the salt works	Year						
	1948	1949	1950	1951	1952	1953	1954
Mettur Chemicals and Industrial Corporation.	93	41	50	72	90	54	..
Digvijay Sinhji Salt Works.	1,000	1,100	1,100	..	..	..	..
Tata Chemicals, Ltd.	..	..	2,736	..	2,709	1,946	797
United Salt Works and Industries.	..	800	..	..	..	..	..

B. STAGES IN THE MANUFACTURE OF SALT AND ITS BY-PRODUCTS

The process of manufacturing salt and of recovering by-products from sea and natural brines is based on gradual evaporation and fractional separation of dissolved solids at different concentrations. The different stages in the concentration of sea brine are:

I. *Stage* (3.9° – 10° Be').—The specific gravity of brine varies from 2° to 4° Be' at 25°C . By evaporating brine of about 3.5° Be' until it attains specific gravity of 10° Be' the original volume is reduced to 37 per cent. At this stage, most of the calcium carbonate is thrown out. Calcium carbonate is abundantly available in India and its recovery from brine is of no economic value.

II. *Stage* (10° – 17° Be').—At 17° Be', the volume of the brine is reduced to 20 per cent of the original. Small quantities of calcium sulphate and all the remaining calcium carbonate separate out at this stage. Sometimes, small quantities of magnesium carbonate also separate out.

III. *Stage* (17° – 24.5° Be').—Calcium sulphate separates out as gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) at this stage. To start with, the separated gypsum floats on the surface of the brine as a thin grey film, but when sufficient quantity accumulates, it settles down at the bottom of the pan. The last condenser in the series employed for the concentration of brine from 17° to 24° Be', should be reserved for the recovery of calcium sulphate. The bed of the condenser should be tamped at the beginning of the season; it should be drained off completely at the end of the season and the bed allowed to dry for 3–4 days. Crude gypsum detaches itself from the bed in the form of a crust and is raked out. It is then washed and dried on bamboo mats to give a product containing 97–98 per cent gypsum.

IV. *Stage* (24.5° – 29° Be').—The crystallisers should be fed with brine of 24° Be'. If the brine is of lower density the salt which separates out would be contaminated with gypsum.

The density of a saturated solution of pure sodium chloride is 26° Be'. However, if other salts are present in solution, the mixed solution behaves as if it is saturated with respect to salt at 24.5° Be'. Salt begins to separate out from brine at 24.5° Be', the density remains steady between 25° Be' and 26° Be', and begins to rise appreciably only after more than 50 per cent of the salt separates out. As the density rises, more and more salt is thrown out until the brine attains a density of 28.5° Be'. At this stage, the bitterns must be drained out from the pans and the salt washed with concentrated brine (24° Be') to remove adhering impurities. Only 70–75 per cent of the salt present in the brine, and not the entire amount, separate out at this stage.

V. *Stage* (29.5° – 35° Be').—Bitterns at 29° Be' are let into a second set of crystallisers and the salt separating between 29° Be' and 32° Be' is collected. The crude salt thus obtained may be used for strengthening the weak brine at the beginning of the season or it can be washed with brine of 24° Be' to remove adhering impurities and marketed.

The residual salt continues to separate out as the brine is concentrated up to 35° Be' and beyond. The salt separating out at this stage is contaminated with potassium chloride, magnesium sulphate and magnesium chloride.

VI. Stage (35° – 37° Be').—This is a very important stage for the recovery of the by-products from sea bitters. Potassium chloride and magnesium sulphate are recovered at this stage. Bitters of 35° Be' are cooled, either naturally during the winter months or artificially by refrigeration, to 11° – 12° C., when magnesium sulphate separates out. The temperature should be maintained at 12° C., and not allowed to fall below this level; otherwise carnallite ($\text{KCl} \cdot \text{MgCl}_2 / 6\text{H}_2\text{O}$) is likely to get deposited.

VII. Stage (37° – 38.5° Be').—This stage is as important as the previous one. Bromine can be recovered by passing chlorine through the bitters at this or at a previous stage. The stage at which bitters are utilized for bromine recovery is determined by the capital and working costs involved in the process. The recovery should in no case be put off to a further stage as it is found that bromine is gradually lost during the V, VI and VII stages. The loss is minimized if the temperature is kept low and the mother liquor is treated with chlorine in the VI or in the beginning of the VII stage.

The mother liquor remaining after the separation of bromine contains potassium chloride, magnesium chloride and traces of sodium chloride. When concentrated to 40° Be', potassium chloride separates out from the mother liquor as carnallite. Any magnesium sulphate remaining in solution also separates out as kieserite at this stage. On suitably treating the carnallite, crude potassium chloride is obtained. It may be purified by fractional crystallisation.

The remaining mother liquor contains mostly magnesium chloride. It is concentrated in open copper vessels (as in Kharaghoda) or in mild steel boiling and pre-heating kettles (as in Mithapur) up to 162° C. and then gradually cooled to 120° C. when the remaining kieserite separates out, either in the same vessel (Kharaghoda) or in separate settling kettles (Mithapur). The molten mass of magnesium chloride is filled into drums, when fused magnesium chloride ($\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$) solidifies to a hard mass.

The stages described above give a general idea of by-product recovery from sea bitters. The method described is by no means the only method employed; it is likely that better and more economical processes may be worked out for recovering the valuable by-products from sea bitters.

C.—PROCESSES EMPLOYED IN INDIA

The processes adopted for the recovery of by-products from bitters in different factories in India are not necessarily identical. Differences in climatic conditions and in the composition of bitters necessitate the adoption of different processes. The processes employed at Mithapur and at Kharaghoda are described here; the climatic conditions prevailing in the two places are different and the types of bitters handled in the two factories are also different.

(a) *Tata Chemicals, Mithapur*.—Bitters discharged from the kyars at 29° Be', are pumped to the second set of crystallisers and concentrated up to 34° Be', by solar evaporation, when crude salt separates out. The salt is washed and used for the manufacture of soda ash.

Bromine and Bromides.—Bitters at 34° Be', are heated to 60° C. and sprayed from the top of a granite tower. Steam is introduced at the bottom and chlorine, part of the way up the tower, counter-current to the descending bitters. The bromine vapour is condensed and purified in stone-ware coils. Most of the bromine is converted into sodium and potassium bromides of B.P. quality.

Epsom salt.—The bitters after the removal of bromine are chilled when crude epsom salt separates out. The crude product is dissolved in hot water and recrystallized in a modern design.

Potassium chloride.—The manufacturing unit consists of 2 sections. In the first, tail liquor from the epsom plant is evaporated in a triple-effect evaporator and settled in stages for the separation of kieserite. In the second section, the liquor left over in the evaporator is chilled in continuous mechanical crystallisers for the separation of carnallite. The carnallite thus obtained is dissolved in water and allowed to stand when crude potassium chloride (KCl, 60–70 per cent) separates out. By further recrystallisation, pure potassium chloride (99 per cent) is obtained.

Magnesium chloride.—The tail liquor from the potassium chloride plant contains mostly magnesium chloride, colloidal organic matter, and small quantities of magnesium sulphate and potassium chloride. The liquor is boiled in open, direct-fired iron kettles and the organic impurities removed by the addition of an oxidizing agent. When the temperature reaches 162°C. the molten mass ($\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$) is allowed to settle and filled into drums.

D.—MAJOR CHEMICAL WORKS ENGAGED IN RECOVERING BY-PRODUCTS

A short description of the two chemical works (i) Pioneer Magnesia Works, and (ii) Tata Chemicals, recovering by-products is given below:—

(i) *The Pioneer Magnesia Works, Kharaghoda.*—Prior to World War I, magnesium chloride was a monopoly of the German chemical industry and it was only in 1915, soon after the commencement of the war, when all imports ceased and the prices of hoarded materials soared sky-high, that an Indian magnesium chloride industry was born through the enterprise of Messrs. Pioneer Magnesia Works of Kharaghoda. The idea occurred at first to Rao Bahadur Maneklal Lallubhai, OBE., the then Collector of Salt Excise, Bombay, that the bitters from the salt pans at Kharaghoda, so rich in magnesium salts, would be a fruitful source of meeting the deficiency of the vital chemical required for cloth sizing by textile mills. After preliminary investigations under the direction of Mr. Turner, the then Principal of the Victoria Jubilee Technical Institute, Bombay, Government considered it worthwhile to exploit the bitters and after inviting tenders entrusted the work on a royalty basis to a new company The Pioneer Magnesia Works, of which the late Sir Rustom J. Vakil, Mr. P. V. Medh and Shri B. S. Lalkaka were partners. Subsequently in 1918, a long-term agreement on a royalty basis was arranged between the Government and the Pioneer Magnesia Works and the latter was subsequently converted into a private limited concern in 1935 and then into a public limited company in February 1954.

The problem of winning of a chemical like magnesium chloride from a complex mixture such as bitters was far from simple, and constant efforts were necessary to prepare a product acceptable to the textile industry. In addition, soon after the cessation of hostilities in 1918, the Company was faced with severe competition from German interests. Meantime the Company got the assistance of Shri Kapilram H. Vakil, who also organised the Okha Salt Works at Mithapur.

Prior to 1939, magnesium chloride and some epsom salt were the only products manufactured at Kharaghoda. With the commencement of World War II, the demand for the former decreased considerably due to

complete stoppage of exports and promulgation of the Size Control Order. In its efforts to find alternative uses for magnesium chloride, the Company met a Defence Department requirement for a chemical in short supply by setting up a plant for the manufacture of calcium chloride by the rather unusual process of adding lime to magnesium chloride.

Bitterns of density of 29° Be' from the salt pans are discharged into *farans* and the density rises to 36° Be'. A part of the original bitterns is led into a set of crystallizers where mixed potassium salts separate out in two stages— $32-34^{\circ}$ Be' and $34-36^{\circ}$ Be'. This salt is taken to the factory for treatment and commercial potassium chloride (KCl, 75-80 per cent) is obtained by fractional crystallisation. If all the bitterns from the salt pans are treated in this manner, 600-700 tons of potassium chloride can be recovered.

A part of the bitterns from the *farans* at 36° Be' is transported to the factory and heated in a series of copper kettles up to 162° C. when most of the magnesium sulphate forms an insoluble monohydrate (kieserite) and settles down. The liquid part consisting of fused magnesium chloride is poured into drums in which it solidifies to a hard mass. The kieserite from the kettles is dissolved in hot water and magnesium sulphate recovered from the solution. The Salt Experts Committee considered the collection of bitterns and their evaporation in the *farans* up to 36° Be' as highly wasteful. A good deal gets lost by percolation in the pits and when the bitterns concentrate from 29° Be' to 32° Be' they deposit an appreciable quantity of crude salt. The Salt Experts Committee suggested that carnallite should be recovered in the following manner:—

After the bitterns have reached 32° Be' in the crude salt pans, they can be transferred to another set of pans for further evaporation to 36° B'. By doing so the potassium chloride present in the bitterns will separate out in the form of crude carnallite ($\text{KCl}, \text{MgCl}_2, 6\text{H}_2\text{O}$). As the original well brine at Kharaghoda has a lower proportion of magnesium sulphate to magnesium chloride, when compared to sea brine, the interference of magnesium sulphate in the separation of carnallite is much less and a prior separation of magnesium sulphate is, therefore, not necessary. If the separation of carnallite could take place in separate pans, we are confident that a much better product would be obtained. At present the crude salt and the carnallite that get deposited in the *farans* are left behind and bitterns of 36° Be' only are removed by the Pioneer Magnesias Works. These valuable salts are washed away during the monsoon every year and thus lost. It is estimated that the quantity of crude salt that deposits annually would exceed 44,000 tons (about 12 lakh maunds) on the present production at Kharaghoda of 1,83,000 tons (50 lakh maunds) of common salt per annum. Similarly, the potassium chloride (KCl) content of the crude carnallite that would be crystallising out would be more than 3,000 tons per annum. The Company feel that 2,000 tons per annum of potassium chloride would be the maximum quantity that can actually be recovered. Potassium chloride is an important fertilizer for increasing the food production in the country. It is also the parent salt from which all other potassium compounds of commerce, namely, caustic potash (KOH), potassium carbonate (K_2CO_3), potassium chlorate (KClO_3), etc. are derived. Some of the naturally occurring deposits of potassium salt of the Punjab have gone over to Pakistan and it is, therefore, essential that we recover potassium chloride from the bitterns. The Salt Experts Committee recommended that a set of two crystallising pans, one for crude salt and another for crude

carnallite, should be built alongside the salt crystallising pans. For evaporating the bitterns from 29° Be' to 32° Be', the size of the crude salt pan, corresponding to the present crystallising area of 20,000 sq. ft. should be 1,700 sq. ft. The size of the pan for crude carnallite should also be similar. However, in place of having one comparatively small pan of 1,700 sq. ft. for the recovery of crude carnallite, the bitterns at 32° Be' from two or more crude salt pans may be led for the convenience of collection to a proportionately larger pan. The bitterns from the crude salt pans will have to be discharged regularly into the carnallite pan as it reaches 32° Be' otherwise some of the carnallite will separate out with the crude salt and will thus be lost. As the salt crystallising pans are at present alongside the railway siding, the location of the crude salt as well as the carnallite pans will have to be fixed as near the railway sidings as possible. The Salt Experts Committee also recommended that the crude salt pan should be leased out to the Agarias along with the salt crystallising pans whilst the Pioneer Magnesia Works be given the first option to undertake the recovery of carnallite. Though, in accordance with the terms of the agreement Government could undertake the manufacture of carnallite departmentally, the Salt Experts Committee did not recommend to Government to assume this responsibility at present. The works recovered this by-product on a small scale from a part of the bitterns handled by them. Their average annual production between the years 1944 and 1947 was 278 tons. The Salt Experts Committee, therefore, recommended that they should be given the option and facility to build pans alongside the proposed crude salt pans for the recovery of carnallite.

The present method of transporting the bitterns from the *farans* to the Pioneer Magnesia Works is primitive. The bitterns are filled manually into small containers either earthen or of galvanised iron and carried by head-loads to tank, mounted on a broad-gauge undercarriage. The tank wagon is then pushed manually to the Works over a distance of as much as 8 miles. In the process of transport the bitterns splash over the labourers and over the permanent way.

It has been decided that the open channel for bitterns should be done away with and the Company should instal a pipe-line for carrying bitterns. They have started on this. They have also been leased an area of 800' x 800' near the Works for storage of bitterns and for the recovery of by-products.

The Company were producing some bromine every year but this plant is not functioning now as the bromine from India cannot compete in the foreign market and it is difficult to market this chemical from India. The percentage of bromine in Kharaghoda bitterns is so many times more than that in sea water. It is roughly estimated that about 1,800 tons of bromine, which now go waste, can be recovered from this source every year. In the opinion of the Company the quantity of bromine that can actually be recovered would be about 600 tons per annum.

Magnesium chloride.—The bitterns are stored in open cement tanks at the Works and are then heated in copper kettles by coal or oil firing. When a temperature of 162°C is reached, the liquor, which is by then mostly fused magnesium chloride, is allowed to settle in the kettles when magnesium sulphate along with other impurities like mud, iron oxide, etc. sinks to the bottom as sludge. The supernatant magnesium chloride is then decanted off into galvanised iron drums where it cools to a solid, fused, white mass. The quality of the magnesium chloride produced is considered

satisfactory both by consumers in India and abroad. When the Works started making magnesium chloride, they were helped by the conditions created by the first World War but after the War they had to face a severe competition from powerful German interests and they applied for protection. The Tariff Board did not support their application in 1924, but in 1925 the Government of India levied a revenue duty of 15 per cent on imported magnesium chloride which helped the Company to continue the production. In 1927 the revenue duty was removed as a measure of relief to the textile industry and almost simultaneously the competition from Germany again became more severe. In 1929, the Works applied again for protection and on this occasion they could satisfy the Tariff Board that with a small measure of protection they could establish the industry within a few years. The protection was granted for a period of 7 years and a duty of Re. 0-7-0 per cwt. was levied on all imports. As a direct consequence of protection, two other factories came into production at Mithapur and Kuda. In 1931 the protective duty was increased to Re. 0-8-9 per cwt. and in 1934 further increased to Rs. 1-5-0 per cwt. or 25 per cent *ad valorem* whichever was higher. In 1939 as a result of a fresh Tariff Board enquiry the protection was extended by a further period of 7 years, but the rate was reduced to Re. 0-12-0 per cwt. On the expiry of this period the protection was renewed year by year till 1949 when the manufacturers themselves declared that they did not require any further protection and it was withdrawn.

The average annual production of magnesium chloride by the Pioneer Magnesias Works between the years 1936 and 1954 is as under:—

Years	Annual production (in tons)
1936-40	6,089
1941-45	3,851
1946-47	4,912
1947-48	5,319
1948-49	5,573
1949-50	7,894
1950-51	2,451
1951-52	2,508
1952-53	1,512
1953-54	3,707
1954-55 . . . . .	..

The fall in production during 1941 to 1945 was due to:—

- (a) substantial reduction in consumption by the Indian textile industry as a result of the Cotton Textile Sizing and Filling Control Order of 1942 which was intended to reduce the demand for starch, and
- (b) fall in exports during the War.

Magnesium sulphate.—The magnesium sulphate present in the magnesium chloride liquor settles out with the sludge in the kettles. This sludge is then dissolved in fresh water and concentrated by solar evaporation in cement pans for the separation of magnesium sulphate. The production of magnesium sulphate by the Works, has, however, been negligible and bears no relationship or ratio to the production of magnesium chloride, as will be seen from the following table:—

(In tons)

Years	Magnesium sulphate	Magnesium chloride
1937-40	241	6,227
1941-45	231	3,851
1946-47	37	4,912
1947-48	32	5,319
1948-49	32	5,573
1949-50	21	7,894
1950-51	6	2,451
1951-52	40	2,508
1952-53	Nil	1,512
1953-54	48	3,707

The progressive reduction in the manufacture of magnesium sulphate is due to the fact that the method employed was dependent upon atmospheric conditions particularly the low winter temperature. Due to a shift in the magnesium chloride manufacturing season the advantage of the low winter temperature could not be taken and the production was very low. However, a plant is being erected whereby the recoveries are expected to be stepped up.

The Company also manufactures calcium chloride and light magnesium carbonate.

Calcium chloride.—This material is largely used in ice factories and for refrigeration. Bitterns and lime slurry are interacted to get calcium chloride solution and magnesium hydroxide. Calcium chloride solution is processed to produce solid fused calcium chloride which is packed in drums as in the case of magnesium chloride. The plant capacity is 1,000 ton per annum while the production is about 450 tons per year. The concomitant product, magnesium hydroxide, is at present a waste product but investigations are under way to utilize it for Epsom salt or light basic magnesium carbonate production.

Light Basic Magnesium Carbonate.—The Company has a plant under erection which will produce this material suitable for use in insulation and in rubber industry. An initial production of about 300 tons per annum is planned which will be progressively increased to 1,000 tons.

The Salt Experts Committee made the following recommendations in regard to this Works.

(a) The lease be extended for a further period of 25 years on the understanding that before the expiry of the present lease they would modernise their plant for the better and more efficient recovery of the by-products;

(b) the bitterns be made available to them only after the recovery of crude salt by the Kharaghoda Salt Works;

(c) the rate of royalty be fixed at Rs. 2 per ton or 2 1/2 per cent of the ex-Works selling price of the products recovered from the bitterns and/or their derivatives, whichever is higher. As the by-products are cheap or essential chemicals, it would not be fair to fix a higher rate of royalty;

(d) to keep check on the efficiency of operation, the quantity of bitterns of 36°Be. taken by the Works be measured when it is loaded into the tank wagons. On the basis that 1 gallon of bitterns at 36°Be. contains 6.4 lbs. of magnesium chloride and allowing for a recovery of only 75 per cent, 4.8 lbs. of magnesium chloride should be recovered per gallon of the bitterns. The royalty charged should, therefore, be subject to this prescribed minimum so that if they fail to recover it they should be required nonetheless, to pay the royalty on this minimum basis; and

(e) if after a period of five years they are unable to bring about an improvement in their efficiency it should be open to Government to increase the rate of royalty.

The lease has since been renewed for a further period of 25 years from 1954, under which besides other conditions, the Company shall pay a royalty to the Government of India at 2 1/2% on the ex-Works selling price of magnesium chloride and magnesium sulphate and a royalty at 1 % on all other products or their derivatives, the minimum amount of royalty in each year being Rs. 5,000. The sum of Rs. 5,000 will be payable by the Company in advance and any excess due to Government will be paid by the 31st March of the year following to which the royalty relates. The Company will also remodel their works according to the phased programme submitted by them.

(ii) *Tata Chemicals, Ltd., Mithapur.*—The by-products recovered at Mithapur are:

(a) bromine; (b) magnesium sulphate; (c) potassium chloride; and (d) magnesium chloride.

The processes employed are not novel and have been developed and modified from time to time in the light of experience gained under Indian conditions. Most of the equipment has been locally designed and fabricated.

Crude Salt.—The bitterns as they emerge from the salt pans at 29°Be' are pumped to a second set of crystallisers, where they are allowed to rise in density to 34° Be' by solar evaporation to obtain a crop of crude salt.

The crude salt is collected, washed and used in the manufacture of soda ash. In this manner a fair quantity of salt which would otherwise be lost and which is lost in other salt works with the bitterns is being recovered. The Salt Experts Committee, however, recommended that the concentration of the bitterns should not be allowed to rise above 32° Be'. In this manner purer crude salt would deposit in the first compartment whilst the salt separating out in the second compartment would be heavily contaminated with the by-products and could be processed separately for the recovery of magnesium sulphate.

Bromine.—The by-product first recovered is bromine. The bitterns are, pre-heated and sprayed from the top in a granite tower where they meet an upward current of steam and chlorine gas. The liberated bromine vapours are carried upwards and condensed in a special type of tantalum condenser. The resulting liquid bromine is separated off and stored in special stoneware jars. Except for the demand from chemical laboratories, which is very small there is no large scale demand for liquid bromine in India at present. The demand is, however, likely to increase in the near future. Most of the bromine recovered at Mithapur is converted into sodium, potassium and ammonium bromides. The annual consumption of the three bromides is comparatively small and is estimated at about 15 tons for the sodium salt, 150 tons for the potassium salt and about 2.3 tons of the ammonium salt. The demand has gone up considerably during the recent years.

Magnesium sulphate.—After the removal of bromine the bitterns after concentrating again to 34.5° Be' by solar evaporation are taken to the epsom plant where they are first cooled on chilling rolls as a result of which crude magnesium sulphate crystallises out and is separated in a centrifuge. Liquor discharged is of 33.5° Be'. The crude magnesium sulphate (80-85%) is crystallised from fresh water or the mother liquor of a previous recrystallisation to obtain a product of 98 to 99 per cent purity. For the druggist or B.P. quality of epsom salt, a further wash with fresh water is given.

Potassium Chloride.—The residual bitterns, after the recovery of the magnesium sulphate are then evaporated in triple effect evaporators when kieserite ($\text{MgSO}_4 \cdot \text{H}_2\text{O}$) separates out in settlers in the hot. The kieserite is dissolved in water and subjected to solar evaporation for the recovery of magnesium sulphate present in it, which is purified by re-crystallisation in the same manner as the product obtained from the chilling rolls. The clean liquor from the settlers is transferred to continuous mechanical crystallisers where it is chilled for the separation of carnallite ($\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$) a double salt of potassium chloride and magnesium chloride. The carnallite is decomposed by agitating with calculated quantity of cold water. The crude KCl thus obtained is further crystallised and KCl of 95.98% is obtained.

Magnesium chloride.—The mother liquor left over after the recovery of carnallite is used for the recovery of magnesium chloride. The process is different from that followed at Kharaghoda. The liquor is heated in iron kettles by direct fire to 161° C and small quantities of potassium chlorate and lime are added to precipitate the iron salts. The hot liquor is then transferred to conical aluminium tanks where the suspended impurities are allowed to settle. The clean molten magnesium chloride ($\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$) is then run off into M.S. drums in which it sets to a solid mass on cooling.

The production of byproducts at Mithapur for the last five years is given below; the figures of production of salt for the same period are also given for the purpose of comparison:

Year	Bromine (lbs.)	Epsom salt (tons)	Potassium chloride (tons)	Magnesium chloride (tons)	Salt	
					Solar (tons)	Vacuum (tons)
1950-51 . .	182,849	682	29	1,320	101,385	..
1951-52 . .	137,796	470	8	297	60,903	..
1952-53 . .	156,422	571	35	1,976	84,514	8,776
1953-54 . .	154,822	288	62	2,193	67,091	9,864
1954-55 . .	238,758	..	22	639	84,117	16,715

The manufacture of magnesium chloride is regulated according to sales and as Indian demand is small, most of Tatas production is exported to English and Continental markets. The foreign markets are very competitive and thus the production is restricted to a considerable extent. Tatas have plans to double their capacity for bromine and bromides to take care of increase in demand. They also have plans to make other magnesium products such as periclase, light basic magnesium carbonate, etc.

E.—CHEMICALS FROM SEA BITTERNS

The constituents present in bitterns of density 29° Be' after the separation of sodium chloride are indicated below. The quantities indicated are calculated on the basis of 100 gr. of sodium chloride separating out of 29° Be'.—

Sodium chloride (separating after 29° Be')	25.00
Magnesium sulphate	20.81
Potassium chloride	2.90
Magnesium chloride	27.61
Bromine	1.01

Further, 0.055 ton of gypsum separates out per ton of salt produced; this can be recovered easily in all salt works.

The salt produced in most of the salt works suffers from the lack of scientific control during manufacture. Brine of low density is usually fed to the crystallizers, and calcium sulphate, which should have been collected in the last condenser, separates out with the salt. Due to the unsatisfactory draining out of bitterns the salt is contaminated with magnesium salts. Further since the beds of crystallizers are not properly prepared and sufficient care is not taken in scraping, the salt is generally contaminated with insoluble impurities.

The recovery of by-products from bitterns in India is greatly impeded by the fact that a large number of salt producing units are small in size and, in consequence, the quantity of bitterns drained out from any one of them

is so small that the setting up of a by-product recovery plant becomes uneconomical. It would be necessary, therefore, either to consolidate the small units into larger salt works or to organise the collection of bitters from different units and to process the bitters so collected in a central factory. The financial return from the salt bitters should result in a reduction in the price of salt.

Complete recovery of by-products from sea bitters and from the bitters of Kharaghoda and Kuda is desirable not only as a means of obtaining valuable industrial chemicals but also as a measure for improving the quality of salt.

Gypsum.—Calcium sulphate being least soluble is the first to separate out during the process of salt manufacture in the condensers, before the salt begins to deposit in the crystallisers (calcium carbonate if any separates out in very early stages). Gypsum begins to separate when the specific gravity of brine reaches 14°Be , and continues up to 25°Be when the salt begins to deposit. Therefore, gypsum can be recovered from the condensers between 14°Be to 25°Be . Recovery of gypsum is about 5% of the total production of salt from sea brine. It is used in the manufacture of artificial fertilisers, cement, plaster of Paris and in ceramics. The Fertiliser factory at Sindri requires 2,000 tons of gypsum per day. In view of our limited resources of gypsum, it is important to recover gypsum. For every one ton of salt, 0.05 ton of gypsum can be produced. Therefore a production of 2 1/2 million tons of salt should theoretically yield about 1,25,000 tons of gypsum annually. Therefore, the salt works could provide a substantial quantity of gypsum if its collection could be made operative everywhere. The salt works at Kuda produce about 4,500 tons of beautiful selenite crystals annually. A good deal of these are being wasted for use as ballast on roads.

F.—BY-PRODUCTS FROM LAKE BITTERNS

Recovery of sodium sulphate and carbonate.—The Sambhar Lake brine does not contain any magnesium or calcium salts. The main ingredients are sodium chloride, sodium sulphate and sodium carbonate. Annually about 80,00,000 maunds salt is produced at Sambhar and 7,20,000 sulphate and 5,40,000 maunds carbonate goes into the bitters and is not recovered at present. Attempts have been made from time to time by several Geologists and Chemical Engineers but with no success. The Salt Research Committee is also seized of this problem though much headway has not been made. Certain professors and others have also been trying on this problem. Recently the Rajasthan Government issued an advertisement for the exploitation of the bitters for the recovery of by-products through private agency. The Central Government, however, suggested to the Rajasthan Government that the exploitation of these bitters should be deferred for the present. The Advisory Board of the Central Salt Research Station, Bhavnagar, at its meeting held on 31-12-1954 decided that a Research Station should be established at Sambhar Lake during 1955-56 to deal with Sambhar brine and bitters on a factory scale. An officer from the Central Salt Research Station, Bhavnagar (Shri P. N. Kathju) has been appointed as Officer on Special Duty and entrusted with the solution of this problem by the Council of Scientific and Industrial Research. He is devoting his whole attention to this problem.

Dr. H. B. Dunnicliff, Chief Chemist, Central Revenues Control Laboratory, wrote a paper on the recovery of the sodium sulphate and carbonate and gave the following views:—

“Whilst burkeite $\text{Na}_2\text{CO}_3 \cdot 2\text{Na}_2\text{SO}_4$ is easily obtained, it is not acceptable in commercial circles where the separate salts are always required.

“The impossibility of separating mixtures of sodium sulphate and carbonate to get salt cake and soda ash of an order of purity acceptable to the market by solar evaporation or simple fractional crystallisations has long been recognised. [Ref. Watson and Mukherjee, Jour., Industries and Labour (U. P. 1922).]

The problem of isolating the carbonate and sulphate of sodium from mixtures of the two containing salt has recently been solved by the Scientific Staff of Searles Lake Industry in California [G. R. Robertson, J. Ind. Eng. Chem. XXXX 133 (1942)] by a process requiring artificial heating and cooling and the device at two stages of adding a solid phase to bring about suitable separation.

“Brine containing these salts (with others) is evaporated at a temperature above that at which sulphate and carbonate can form decahydrates. Salt in the form of coarse crystals together with burkeite ($\text{Na}_2\text{CO}_3 \cdot 2\text{Na}_2\text{SO}_4$) and a little sodium carbonate monohydrate separate as fine crystals. This mixture is passed to a ‘salt tap’, a conical separator in which the salt settles down. Counter current washing removes the burkeite—carbonate slurry which is passed to a ‘clarifier’ which it enters in the middle. The thickened slurry which separates at the bottom is passed into Oliver filters. This burkeite (containing some sodium carbonate monohydrate and salt) is dissolved in steam condensate at 27°C . The solution, when cooled to 22°C , deposits Glauber’s salt, the yield being favoured by the removal of water from the solution as the ten molecules of water of crystallisation $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$. It is filtered off and the mother-liquor is heated to 70°C . Salt containing burkeite and sodium carbonate monohydrate is added and the big crop of burkeite deposited is sent back to the start as raw material for further processing. Cooling the liquor to 30° affects the loss of some salt, raising the solubility of the sulphate above crystallisation point. A sudden external cooling of the liquor by liquid ammonia results in the deposition of $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$, which is recrystallised at high temperatures yielding the monohydrate. When heated in rotary dryers, this yields soda ash; 58.2 to 58.3% Na_2O against trade requirement of 58.0% Na_2O or better, and theory; 58.49% Na_2O .

“Glauber’s salt is converted to the anhydrous salt by mixing salt with it and treating the mixture with low pressure ‘steam’ when the salt is removed as brine and anhydrous sodium sulphate remains.

“A chemical process is possible by treating the dissolved solid raw material or the bitters from the kyars or the mother-liquor from the bitters areas with carbon dioxide gas under adequate pressure at the ordinary temperature. Sodium bicarbonate is formed from the sodium carbonate, a process assisted by the presence of much sodium chloride which lowers the solubility of the bicarbonate. It is deposited in a slurry which is coloured by colloidal remain of the algae etc. The bicarbonate is separately washed, dried and then heated to decompose it. In this process, the organic impurities may be burnt away or rendered insoluble. The soda ash will need recrystallisation in the latter case.

"The highly coloured residual liquor contains chloride, sulphate and residual carbonate. The colour is not removable by filtration and contaminates anything crystallised from the solution. If, however, the solution is just acidified with sulphuric acid, the colloidal colouring matter is coagulated. The filtered solution can then be worked for sulphate by chilling when the decahydrate will crystallise out. On treatment with salt and low pressure steam, the anhydrous salt is recovered as in the Searle's Lake Industries Process."

Dr. Dunnicliff, who was also the Chairman of the Naturally occurring Salts Committee of the Board of Scientific and Industrial Research, evolved a process for the recovery of sodium carbonate, sodium sulphate and sodium chloride from deposits or efflorescences consisting of (a) a mixture of all three salts, or (b) sodium carbonate (and bicarbonate) with either sulphate or chloride. He wrote as follows:—

"The method I propose for investigation depends on the principle that sodium carbonate readily forms sodium bicarbonate by the action in solution, even at atmospheric pressure, of carbon dioxide gas upon it. If the reaction is carried out below 25°C., the sesquicarbonate, Na_2HCO_3 , NaHCO_3 , $2\text{H}_2\text{O}$, is not formed nor is the compound $2\text{Na}_2\text{SO}_4$, Na_2CO_3

In the presence of carbon dioxide and much sodium chloride the solubility of sodium bicarbonate is reduced to below 1.5%.

Hence, to separate the three salts, I suggest:

(a) treating the filtered solution containing the three salts with carbon dioxide in suitable closed vessels under about one atmosphere pressure and with stirring until the pressure gauge indicates that the reaction is complete. The bicarbonate separates as a fine deposit;

(b) this deposit would be removed in a filter press and

(c) after drying, heated in a suitable furnace to recover the carbon dioxide and, if necessary;

(d) ultimately, in a current of air to oxidise any organic impurities;

(e) the carbonate could be recrystallised, if necessary;

(f) the liquor from the filter-press contains sodium chloride and sulphate together with a little bicarbonate. This liquor should be neutralised with sulphuric acid and the sulphate and chloride separated in the usual way.

"BITTERNS AT SAMBHAR AND MOTHER LIQUORS IN THE EAST LAKE BITTERNS AREA, SAMBHAR LAKE, RAJPUTANA

Bitterns sa't etc.—As a result of experiments done on a very small laboratory scale, the following method is suggested for the separation of the constituents of the bitterns etc. from the salt sources of Rajputana, which are worked by the Government of India under lease from the Durbars of Jaipur and Jodhpur States.

"Enormous quantities of bitterns exist in the kyars from which salt (sodium chloride) is crystallised. This is produced annually. These bitterns have been thrown into a portion of the area called the East Lake

for many years and owing to three years partial drought this area has now put down heavy deposits of crystals, some layers of which are rich in carbonate and sulphate as is also the dark coloured mother-liquor which impregnates them. The total area extends over about 1,500 acres.

Composition of Bitterns

	I Compo- sition of Bitterns.	II Compo- sition of mother liquor.	
Sodium chloride	66.1%	61.0%	} Calculated on a "dry" basis.
Sodium sulphate	21.3%	22.7%	
Sodium carbonate (Calculated as Na ₂ CO ₃)	12.6%	16.3%	
<hr/>			
Water present in the actual liquor.	about 71.0%	about 67.69%	

"Both classes of liquor are highly coloured, especially the mother liquor which also is malodorous, mainly due to sulphide, produced from sulphate by sulphate-reducing bacteria. The colouring matter is due to marine algal residues and exists in an unfilterable colloidal form.

"The process proposed above was tried out on the second liquor in the laboratory *in vitro* and gave fine deposit of sodium bicarbonate which, when filtered off and dried, was of a dirty reddish colour.

"Pressed between filter papers and analysed it contained 60.5% sodium bicarbonate, 2.1% sodium carbonate and moisture and was somewhat contaminated with chloride and sulphate. It is expected that by centrifugalisation and rapid washing with a quick "swill" of cold water, most of the chloride and sulphate would be removed. In any case, re-crystallisation after ignition which is necessary to remove the colour, would probably give a very pure product.

"When the residual liquor is treated with sulphuric acid to just an acid reaction, the colour clears up and the solution is filterable to a yellowish liquid containing sulphate and chloride only. From this liquor sulphate and chloride can be separated.

"This is only a bare outline and based on a very small laboratory experiment but it appears to me that this process for the removal of bicarbonate which requires no fuel or fresh water supplies in any quantity is worth examining on a larger scale. Electricity is available at Sambhar.

"The solid sodium bicarbonate could be transferred elsewhere for conversion into carbonate and the neutralised solution could be evaporated and fractionated for sodium chloride and sulphate by the sun's heat and breezes as the brine is at present.

"Further refining would presumably have to be done elsewhere.

"The Salt Deposits in the East Lake.—One of the layers in the salt deposit is calculated to exceed the amount of about 33,00,000 maunds. The following is the composition of one section of it calculated on a dry basis:—

Insoluble	{ Inorganic	0.35%	
	{ Organic	0.12%	
Sodium chloride		37.70%	
Sodium sulphate		31.79%	
Sodium carbonate		15.47%	} Equivalent to 29.19% Na_2CO_3 .
Sodium bicarbonate		14.57%	

"It seems to me worthy of consideration also whether this enormous store of sulphate and carbonate is not working on a commercial scale.

BITTERNS SALT

"A typical sample analyses worked out as follows:—

	%
NaCl (Cl in terms of)	73.77
Na_2SO_4	21.79
NaHCO_3	0.42
Na_2CO_3	0.75
Insoluble (inorganic)	0.21
Insoluble (organic)	0.17
Moisture	2.60
Undetermined	0.29

"Neutralisation of the small quantity of carbonate present in this causes the substance carrying the red colour to separate in a filterable form and from the yellowish filtrate, chloride and sulphate can be obtained."

He also wrote to Shri Kapilram H. Vakil and asked for his assistance and enquired if he would design a pilot plant for the recovery of by-products and give some idea to the Government. Shri Kapilram suggested as follows:—

"I fully agree with you that the mixed salts have great economic importance. The process outlined by you in your letter under reply and in your confidential report of 20th July, 1940 now requires to be carried out on a larger scale. A pilot plant is necessary and it should be designed with a view to work out not only the details of the process but also all the problems of chemical engineering connected with this investigation.

This work demands very careful and complicated designing. I visualise, taking your preliminary work for guidance, the provision of the following important parts:—

1. For stages (a) and (b) of your process, pulverizing and lixiviating plant with saturators and settling tanks with auxiliaries such as agitators, pumps, etc.

2. Designing the proper type of towers, their capacities, their sizes and the auxiliaries required for getting correct data of the conditions of the reactions.
3. Generation of carbon dioxide in lime kilns, the type of kiln selected—its design and the percentage purity of the gas aimed at.
4. Purification of the gas by scrubbing, its composition by specially designed CO_2 compressors and its handling and its cooling. Results obtained from CO_2 cylinders with 100% pure gas would be of very little value as gases of such high purity are not used in technical processes on account of their high cost.
5. The magma containing sodium bicarbonate will have to be filtered out and washed on specially designed vacuum filters.
6. The next step would be the treatment of coloured sodium bicarbonate. If it is calcined without treatment, the problem would not be difficult but if the calcined material is coloured then sodium bicarbonate will have to be redissolved and treated chemically and reprecipitated. What the process would be, we do not yet know.

The question of redissolving and reprecipitating the bicarbonate would be an extremely difficult and expensive part of the process.

7. Calcination of the bicarbonate is considered by the alkali manufacturers, a very difficult and specialised operation which calls for expensive calcining furnaces.
8. The treatment of mother liquor containing sodium sulphate would form a separate section of the plant. Sodium sulphate and sodium carbonate are roughly in the proportion of 22 to 13 as shown by your analysis and as sodium sulphate is of technical importance its recovery may be useful but the question arises whether the whole of the sodium sulphate should be recovered.

The recovery of sodium sulphate would be a distinctly separate piece of research work.

“My observations are as under:—

1. If Auden's observations are correct, investigations for the recovery of sodium sulphate and sodium carbonate from the mixed salts at Sambhar should be undertaken and if they give successful results, an industry of considerable magnitude and importance to the country could be established.
2. Results obtained from small scale operations would be of no value in arriving at conclusions regarding the nature of the plant required for commercial operations.
3. The size of the pilot plant will, in the first instance, have to be determined and every unit properly designed and co-ordinated. The layout will have to be carefully prepared for continuity of operations of the process in all its stages from beginning to end.
4. This would naturally require a staff of mechanical and chemical engineers supported by analytical chemists.
5. Before the pilot plant can be designed, a great deal of spade work will have to be done as it cannot be prepared without the necessary technical data.

The design of the pilot plant will have to be flexible and may require additions and alterations as the investigation proceeds and financial provision should be made for such changes.

You will thus realise that though the question of the recovery of valuable products for mixed salts is of far reaching importance it cannot be undertaken without sufficient resources in right type of plant, men and money.

6. The question would therefore finally depend upon what finances Government would make available for this investigation. If the problem is to be tackled as it should be tackled, it would require about rupees three lakhs for buildings, plant, laboratory, wages and salaries. This estimate would be subject to detailed calculations which would involve considerable work in the preparation of estimates.

7. The next question that arises is the location of the pilot plant. If the pilot plant is located at Sambhar, it will have to be under a first class chemist and chemical engineer and his salary alone for the duration of the investigation, say 3 years, would be about Rs. 36,000 to 40,000.

I do not believe in any half-hearted measures. India has during the last 40 years wasted enormous sums of money on so-called researches and investigations which have proved worthless as hardly any of them has resulted in the establishment of any industry of national and economic importance.

8. There are many other questions relating to this problem which can be discussed after ascertaining the wishes of the Government on the subject."

A Central Salt Research Institute was established in 1953 at Bhavnagar in Saurashtra. Its one of the main functions is to conduct investigations on the economic recovery of other salts (by-products) which are present along sodium chloride in salt sources, and to utilise them for the manufacture of other industrially useful chemicals. Another important function of the Institute will be to devise tests for the determination of the quality of salt and salt products.

Recently also attempts have been made to recover the by-products, especially since the setting up of the Central Salt Research Station at Bhavnagar. Regarding removal of pinkish colour and the pungent smell from Sambhar bitters Dr. Mata Prasad, Ex-Director of the Research Station, applied for a "Patent" for "A process for the removal of pinkish colour and offensive smell from Sambhar bitters," and will be devoting his attention to this question.

CHAPTER XXV

DEVELOPMENTS FOR MAKING INDIA SELF-SUPPORTING IN SALT

A.—INTRODUCTORY

It has been seen in the Chapter on the Foreign Salt that India imported about 5,70,000 tons (160-165 lakhs of maunds) or about 25-30 per cent of her total annual consumption of salt. This salt was imported into Bengal and Burma. Most of this salt came from foreign countries. Indian opinion was adverse to this import and often strongly expressed itself in the Assembly. In 1926 the Indian Taxation Enquiry Committee stressed the overwhelming importance of a well developed salt industry to India for her economic advance and reported that it was desirable to make India self-supporting in the matter of her salt supply and recommended an inquiry by the Indian Tariff Board. The Central Board of Revenue examined these proposals. The problem according to the Board was whether the Bengal market could be supplied by Indian sources. The Board ruled out the possibility of Northern India Salt Sources supplying this market because of the long railway lead and consequent prohibitive freight rates. They considered Bombay salt to be so inferior as not to be able to find any market in Bengal and they ruled out the Sind sources near Karachi as incapable of further expansion because of shortage of labour supply. Tuticorin salt they thought was fit for Bengal, but the production could not be appreciably increased as pit brine was used, the supply of which was limited. The Government of India accepted the views of the Central Board of Revenue, and the matter was not referred to the Tariff Board. The Assembly, however, again pressed the matter and Government agreed to refer the matter to the Tariff Board in 1929. The Tariff Board was asked to report, "whether having regard to all relevant considerations it is desirable in national interests to take steps to encourage the production of salt in India suitable for markets now served by foreign salt and what measures were to be adopted".

B.—TARIFF BOARD'S REPORT

The Board examined the question and submitted their report in September 1930. Their main conclusions are shown in an outline below:—

- (1) That fine white crushed salt of the quality requisite to enable the foreign article to be entirely replaced in the Bengal market could be produced in sufficient quantities and at a reasonable price in India.
- (2) That for this purpose Aden should be treated as part of India. The following reasons led the Board to regard it as such. On the civil side Aden was subordinate to Bombay Government. Aden had four salt works out of which three were in Indian hands. Aden manufacturers paid ground-rent and royalty rent to Bombay Government and were liable to Indian income-tax. Most of the superior labour employed was Indian. During War time, Aden, Karachi and Okha stood on the same footing since all were liable to have their line of communication with Bengal stopped owing

to stoppage of shipping facilities. Besides, Aden had been a pioneer in supplying India with fine, white salt. It had Indian vested interests. India also was not likely to be able to dispense with Aden salt. So the Tariff Board did not discriminate between Aden, Karachi and Okha.

- (3) That in order to develop Indian production to this extent the main desideratum was the stabilisation of prices at a fair level in relation to the cost of production.
- (4) That Rs. 66 per 100 maunds *ex-ship* at Calcutta, would represent such a fair level, and would not be burdensome to the consumer compared with the average of prices in the past.
- (5) That the greatest public advantages would be derived from making India self-supporting, if the Northern India Sources were developed, so that the Bengal market would be supplied to a large extent by rail-borne rather than by sea-borne salt. The development of the Indian sources would secure the following advantages:—
 - (i) A guarantee against shortage in war time.
 - (ii) Additional traffic for Railways.
 - (iii) Additional business for Indian steel, iron and wagon companies, and a reduction in the price of salt at the Northern India sources as a result of increased production.
 - (iv) The advantages that would follow the development of the supply of sea-borne salt of Indian origin to the Bengal markets they definitely pronounced to be of insufficient importance from the national point of view to justify by themselves the placing of any considerable burden on the Indian consumer. Indian sea-borne salt was only to be encouraged so far as might be necessary to make up any deficiency in the supply, and without undue hardship to the consumer.

The measures advocated by the Tariff Board for giving practical effect to their conclusions were, briefly, as an *interim* measure, the immediate assumption of the control of the imports of salt into Bengal by the Government, which was to buy all the salt and sell it at standard rates and ultimately the constitution of a Marketing Board, subject to such degree of statutory control as might be necessary in the public interests for regulating the salt trade throughout India. One of their recommendations was that Government should undertake a thorough inquiry into the potentialities of the various salt sources of India. This enquiry was entrusted to Sir Chuni Lal Mehta and Mr. C. H. Pitt, late General Manager, Salt Range Division, Khewra, who submitted their report (Salt Survey Committee Report) in 1931.

C.—STEPS TAKEN BY GOVERNMENT

In January 1931, on the motion of Sir George Schuster, the Legislative Assembly sanctioned the appointment of a Committee of ten members of the House to consider the Tariff Board report on the Salt Industry as also the report of the Salt Survey Committee. After the two reports had been examined by the Committee set up by the Assembly, that Committee recommended the immediate imposition of an additional duty of 4½ annas per maund on all salt Indian or foreign imported by sea into British India.

It also recommended that the executive be empowered to increase the duty up to one anna per maund, if further fall in prices of foreign imported salt justified it, the object being to adjust the price of such salt *plus* duty as nearly as possible to the level of the fair selling price as defined by the Tariff Board.

The Committee further recommended that a rebate equal to the additional duty should be granted on the imported Indian salt, on the producer undertaking to deliver a stipulated quantity of salt to the Government at any time at the fair selling price fixed by the Tariff Board.

The proceeds of the duty which would amount to about Rs. 34 lakhs, were to be ear-marked for the development of Northern India Salt Sources, for investigation into the development of other sources, for example in Bengal, Bihar, Orissa and generally on the East coast and for any measures necessary to secure the stabilisation of prices such as the establishment of a Marketing Board and provision of working capital and reserves for such a Board. Any balance of the proceeds of the duty was to be distributed to the provinces consuming imported salt which would bear the burden of the extra duty. The report was not unanimous. One or two members emphatically dissented from the report in the interest of the Bengal consumer. One of the members was afraid that a large protective duty to Aden manufacturers might be utilised to strengthen their position and retard the full development of India's production.

D.—SALT (ADDITIONAL IMPORT DUTY) ACT, 1931

The recommendations were embodied in the Salt (Additional Import Duty) Act No. XIV of 1931 which came into force from 18th March 1931. Under this Act a duty of Re. 0/4/6 per maund was levied on all salt Indian or foreign imported by sea into British India and a rebate equal to this was to be allowed on imported Indian salt, Aden being considered a part of India. Imports by land from the Portuguese and French India too were subject to this duty. Later on the Act was extended to the end of 1932-33.

The object of the Act was to stabilise the prices of salt, to assist the Indian Salt Industry against foreign competition in the Bengal market and to secure to the Indian manufacturer an economic and fair selling price for the salt that he may export to that market. This extra duty was opposed by Bengal and Assam. They argued that it was invidious to increase the privations of the consumers in East India merely to encourage the development of salt manufacture in Western India.

The effects of the additional duty were noticeable within a few months. The prices of salt in the Calcutta market were stabilized at the level indicated by the Tariff Board. Imports of foreign salt declined. The demand for Indian salt increased. The Tariff Board's figure of Rs. 66 per hundred maunds *ex-ship* gave Indian producers a reasonable margin of profit and made it possible for them to expand their works.

Considerable increase also occurred in the imports into Calcutta from Karachi and Okha. The production of Aden too was enormously stimulated; each of the four concerns there had a record output during 1931.

During 1932-33 too imports into Bengal from Aden and Indian sources kept on increasing. Aden supplied 79.11 lakhs (50.63 per cent.), Okha 9.19 lakhs (5.89 per cent.), Karachi 9.44 lakhs (6.04 per cent.), Navalakh

(Morvi State) 1·92 lakhs (1·23 per cent.), Porbandar ·97 lakh (·62 per cent.), Madras 4·02 lakhs (2·58 per cent.), Bombay 3·56 lakhs (2·27 per cent.), and all the foreign countries (England, Germany, Red Sea sources, etc.), together 30·74 per cent of the total imports.

On the 1st April 1931 the Legislative Assembly adopted a resolution sponsored by the Finance Member under which seven-eighths of the additional import duty was to be distributed among the provinces consuming imported salt and the balance of one-eighth was to be devoted to the development of Northern India Salt sources and to the investigation of the possibility of development of other sources in India. The proceeds of the duty were expended on these lines. During the debate on the above Resolution in the Assembly particular stress was laid on the desirability of conducting investigations into the possibilities of salt production in Bengal. The Government of India followed up this suggestion by deputing Mr. C. H. Pitt, the then General Manager, Salt Range Division, Khewra, to make the necessary investigations in Bengal and Orissa, visiting such places as might appear to afford opportunities of salt production. Reference to this enquiry and to Mr. Pitt's recommendations has already been made.

E.—SALT ADDITIONAL IMPORT DUTY (EXTENDING) ACT, 1933

The Salt Industry Committee of the Legislative Assembly further reviewed the position of the industry in March 1933 and recommended stabilisation of price level at Rs. 54/12/- per 100 maunds *ex-ship* taking into account the reduction in shipping freight, and reduced the protective duty to 2 annas 6 pies per maund to lighten the burden on the consumers of imported salt. The proposal was adopted and embodied in the Salt Additional Import Duty (Extending) Act, 1933, which came into force from 30th March 1933. This reduction of extra duty did not result in any increase in imports of foreign salt. During 1933-34 imports from Aden and the Indian sources into Bengal increased still further and the share of the foreign countries fell from 30·74 per cent in 1932-33 to 10·82 per cent in 1933-34.

The Salt Industry Committee of the Legislative Assembly met again in February 1934 and recommended the continuance of additional protective duty at 2 annas 6 pies per maund and the stabilisation of price level at Rs. 50 per 100 maunds instead of Rs. 54/12/0. The Act was accordingly extended up to 30th April 1935 with this modification and was next year further extended up to the 30th April 1936.

In April 1936 the Legislative Assembly passed the Bill extending by two years the operation of the Salt (Additional Import Duty) Act of 1931 subject to a reduction of the rate of duty to one and a half annas.

F.—INDIAN SOURCES—POTENTIALITIES AND DEVELOPMENT SCHEMES

(i) *Northern India Sources.*—The Tariff Board laid great emphasis on the development of the Northern India Salt Sources. The Board were not so keen on the sea-borne salt of Indian origin as on the rail-borne. Khewra, Sambhar and Pachbadra were the main Northern India Sources considered by the Board. They were of the opinion that these could increase their output by 150,000 tons (42 lakhs of maunds).

1. *Khewra*.—The Khewra Mine (now in Pakistan) contains huge reserves of salt. The deposits extend over a mile and are over 600' thick. In 1870 Dr. Warth estimated the mine reserves at 2,000 lakh maunds or about 7 million tons. Recent investigations by the Geological Survey of India show the minimum reserves to be 4 million tons. The usual output has been about 30 lakh maunds or about 100,000 tons per annum. The mine could produce 60 lakhs of maunds or 200,000 tons annually. The Salt Survey Committee, however, were doubtful whether this output could be maintained for long periods by the present labour and consequently suggested the introduction of machinery to bring down the rates of excavation to as low a figure as possible to enable crushed salt to compete successfully in Bengal.

A crusher plant was installed at Khewra and it was proposed to raise the output to 45 lakhs in the beginning, 30 lakhs as usual for the Punjab market and 15 lakhs for Bengal, though the crusher plant was designed to deal with a total output of 60 lakhs. This scheme cost about two lakhs and thirty thousand rupees.

It was first thought that with an output of 60 lakhs the cost of crushed salt at Khewra would come to about 3 annas a maund. A specially reduced freight rate of Re. -/11/- per maund for crushed salt was sanctioned by the Railways. The cost f. o. r., Calcutta worked to Re. -/14/- or Rs. 88 per hundred maunds. It was expected that salt would compete very near Calcutta, if not at Calcutta itself. However, with the fall in prices of imported salt the possibility of the Khewra salt becoming a commercial proposition got very much diminished.

2. *Pachbadra*.—The output of the source has varied from 4 to 11 lakhs. The question of the potentialities of the source is a vexed one. The Salt Survey Committee considered the source capable of producing 40-50 lakhs of maunds per annum. They recommended a thorough topographical survey to be done and thought that when fully developed Pachbadra could produce 1,00,000 tons for the Bengal market. The topographical survey of the Pachbadra salt basin was completed in April 1932. A rough provisional scheme for the expansion of the salt source at Pachbadra and crushing of salt for supply to Bengal was formulated by the Northern India Salt Revenue Department. It involved an expenditure of over Rs. 10 lakhs and provided for:—

- (i) the lay-out of 25 long pits of the outside dimension of 3,207' × 167' in about 5 square miles of land, sub-divided into 6 compartments. Each large pit was expected to yield about 1,20,000 maunds of salt per annum, and
- (ii) transport of the salt extracted from these pits by mechanical haulage direct from the pits to a Central Store where the salt would be crushed, bagged and loaded for the Bengal market in the Railway's metre-gauge sidings and then railed to its destination.

Besides, it is also possible to manufacture at a small cost good edible pan salt from sub-soil brine. Pan salt can be manufactured quickly and can be made to augment the supply of pit salt.

It was estimated that on an output of 30 lakhs for the Bengal market the cost of production would come to 2 annas 3 pies; adding 4 pies for dispatch and 8 pies for crushing and Re. -/10/4 railway freight to Calcutta, the cost f. o. r. Calcutta would be about Re. -/13/7 a maund or about Rs. 85 per hundred maunds. It was obvious that Pachbadra salt could

not be sold in Bengal unless and until the price of foreign imported salt was higher than Rs. 85 per hundred maunds. The price was however much less and this ruled out the marketing of Pachbadra salt in Bengal. The scheme to expand the production of salt at Pachbadra with the object of placing its output in the Bengal market had therefore to be abandoned.

3. *Sambhar Lake*.—Output has varied enormously ranging from 5 lakhs to 126 lakhs, the usual output being about 70-75 lakhs. The Tariff Board suggested that Sambhar salt might be supplied to the Bengal market. The Salt Survey Committee, however, were doubtful whether the salt would be acceptable to Bengal. They considered that the pan salt which was formerly manufactured from sub-soil brine obtained from wells sunk in the bed of the lake, would have a better reception in the Bengal market, as it was whiter than ordinary Sambhar salt, being free from algae. An area of about 1,300 acres could be developed in three different sections and an output of 50 tons per acre or a total of 65,000 tons could be expected. The cost was bound to be high and so it was suggested that the work be given out on contract and in the beginning pan salt might be produced as an experimental measure, and its sodium chloride content and colour tested.

They also suggested that by clearing of silt and reducing the slopes of the banks of the Sambhar and Nawa canals the supply of canal brine could be increased and an extra output of 10 lakh maunds could be expected. The production could be increased to a crore of maunds—thus Sambhar could send 30-40 lakhs to the Bengal market.

The cost of production would work out to about 2 annas 5·4 pies per maund and that of crushed salt to 2 annas 9·4 pies. Under terms of Treaties, Royalty to the Jaipur and Jodhpur Darbars amounted to 3/5 of the selling price and so the selling price of crushed salt at Sambhar would be about 5 annas a maund and taking the freight to Calcutta at 8 annas a maund, the cost f. o. r. Calcutta would be Re. -/13/- a maund or Rs. 81 per hundred maunds.

As there did not appear to be much hope of ordinary Sambhar salt competing at Calcutta with foreign salt, steps were taken to send reshta salt (fine grained wind salt) to Calcutta. The B. B. & C. I. and E. I. Railways allowed the following freight concessions on reshta salt on the representation of the Salt Department:—

- (1) The minimum rate of 0·1 pie per maund per mile to each station.
- (2) Plus 2 pies per maund for transshipment.
- (3) Plus the rates from Howrah.

These concessions gave reshta salt a fair advantage over imported salt. This salt was in great demand in certain parts of Bengal and Bihar.

4. *Didwana*.—This is another source in Rajasthan not mentioned by the Tariff Board. The output has varied from 2 to 16 lakhs per annum and can be increased; but the sodium chloride content of the salt is very low, being about 80 per cent; so the salt is unfit for the Bengal market. The output can, however, be increased for the local market, where the salt is consumed.

(ii) *Sind sources*.—*Sea Sources*.—The salt industry at Karachi was capable of considerable expansion and improvement both from the point of view of quantity and quality.

Karachi sources possessed many natural advantages, such as light rains, impervious soil, sea breezes, high density brine, etc., for salt manufacture. The Tariff Board and the Salt Survey Committee agreed that there would be no difficulty in securing an adequate supply of labour for the increased output, a point about which the Central Board of Revenue were doubtful. Karachi works, when efficiently developed, would be capable of an output of 90 tons per acre. Tariff assistance was granted to the Indian Salt Industry in March 1931. Since then the Karachi Salt Works received a great stimulus.

The output from about 10 lakh maunds in 1929-30 rose to about 34 lakh maunds within ten years, that is, in 1939-40, and exports to Calcutta, which were hardly 5 lakh maunds in 1929-30, rose to 20 lakh maunds. All the four salt works rapidly expanded during this period. As transport facilities were essential for the full development of salt works, various schemes were considered and implemented by the works.

The Tariff Board considered that Karachi sources could supply 87,000 tons to Bengal when well developed. The Salt Survey Committee was of the opinion that the sources could be developed to supply 180,000 tons. Both the Board and the Committee held that the cost of production was not very high. Karachi salt compared favourably with other solar salts sold at Calcutta.

(iii) *Okha Salt Works*.—The Tariff Board and the Salt Survey Committee both were of the opinion that Okha salt was fit for the Bengal market. The former considered Okha to be capable of supplying 60,000 tons annually.

On an estimated output of 60,000 tons, the Company considered the cost of salt to be Rs. 3 per ton. The cost calculated by the Tariff Board and the Salt Survey Committee c. i. f., Calcutta was about Rs. 64 per hundred maunds. The quality of salt was good—asphalt pans could produce a very good salt which could successfully compete in the Bengal market with other Indian or Aden salts. The works produced over 17 lakhs of maunds in 1934-35.

(iv) *Morvi Salt Works*.—These works are well situated like the Okha Works. The area under development in 1935-36 was about 625 acres. It was thought that this area alone could give 40,000 tons, or 11 lakh maunds per annum. The Salt Survey Committee were of the view that the salt could compete successfully in the Calcutta market. The exports to Calcutta from the works increased gradually from 1.9 lakh maunds in 1932-33 to 8.38 lakh maunds in 1939-40. Bhavnagar, Nawanagar and Porbandar States too were permitted to export salt to Bengal. Works much developed in Porbandar which exported 3.5 lakh maunds in 1933-34. Exports gradually rose to 5.34 lakh maunds in 1947-48.

(v) *Bombay*.—The Indian Taxation Enquiry Committee suggested that the manufacture of salt suitable for Bengal should be encouraged in Bombay and Madras. The Tariff Board did not think that the Bombay salt would be acceptable to Bengal. Bombay salt sources suffered from some

serious disadvantages. All around the works the area is composed of thick alluvial mud which becomes a plastic mass during the rains. It is impossible to erect any works of permanent nature. Moreover, the heavy rainfall damages the works and pans, necessitating a great expenditure on repairs. The working season is short. Thus the cost of production rises. Besides, the system of grading and sale by measures encourages the production of a light salt unfit for the Bengal market. The salt is large grained and dirty, and being moist, it cannot be easily crushed.

Taking into consideration the cost of production, carriage to ship, ground rent, freight to Calcutta, and crushing charges, the price at Calcutta came to about Rs. 65-70 per hundred maunds. So the salt had not got much chance.

(vi) *Madras*.—The position, as regards Madras, is rather better though not quite hopeful. The system of sale by measure has the same effect here as in Bombay. Moreover, most of the salt was manufactured by licensees with whom the primary consideration is to prepare a quality which would command a ready sale. Purity of the article produced was only a secondary consideration. Attempts were made in 1914-15 to send white salt from Government factory at Vallur to Calcutta, but the transaction did not prove profitable. It was felt that the protection afforded by the Salt (Additional Import Duty) Act, 1931 did not have practical application to the Madras Presidency as the freight charges for transport of salt by sea to Calcutta were very high. It was, however, thought that Tuticorin salt could be sold in Bengal as Tuticorin had considerable natural advantages. The production at Tuticorin, however, could not be expanded as the supply of pit brine was limited. Tuticorin, however, did export 4.5 lakh maunds of salt per annum from 1932-33 onwards.

(vii) *Bengal, Bihar and Orissa*.—A detailed account of the salt industry in Bengal, Bihar and Orissa has already been given. Various steps were taken by the Local and Central Governments to revive the local salt industry. Investigations into possibilities of manufacture were made by Mr. Pitt, and by the salt experts from Burma and Sind. Licences were issued to various firms and persons to manufacture salt. Government were giving all possible help and facilities to the manufacturers. Salt manufactured in Bengal, is, however, handicapped by many natural circumstances. The chances of the State being self-supporting in salt are remote owing to the production being uneconomic.

G.—TRANSPORT COSTS AND THEIR BEARING ON THE PROBLEM

Under (F) above passing reference has been made to the obstacle placed in the way of salt from the Northern India sources being marketed in Bengal by railway freights. This subject will be dealt with in a more general way in this section. In their report on the Salt Industry the Tariff Board coupled their suggestions for the development of the Northern India salt sources with suggestions for the reduction of railway freights from those sources to Bengal, *vide* paragraphs 59 to 61 of the Report. As a result of correspondence with the Railway Administrations concerned, the Government of India were able to secure the following concession rates of freight

on crushed salt from Sambhar, Khewra and Pachbadra and on *reshta* salt from Sambhar to Calcutta and stations west of Calcutta:—

Freight rates from Sambhar

- To Calcutta (Howrah) . . . 1 pie per maund per mile *plus* 2 pies per maund for transhipment, or 8 annas 5 pies per maund.
- To stations short of Calcutta . Freight at the minimum rate of .1 pie per maund to the destination *plus* the rate from Howrah to the above destination.

Freight rates from Pachbadra

- To Calcutta (Howrah)1 pie per maund per mile *plus* 2 pies for transhipment at Agra East Bank, making the total through rate 10 annas 4 pies per maund (inclusive of 1 anna 10 pies for freight on the Jodhpur Railway Section).
- To stations short of Calcutta on the E.I. Railway. Freight at the minimum rate of .1 pie per maund to the destination *plus* the rate from Howrah to the above destination.

Freight rates from Khewra

- To Calcutta (Howrah) 11 annas a maund calculated at the minimum rate of .1 pie per maund over the distance of Calcutta from Khewra, *viz.*, 1318 miles.
- To stations short of Calcutta on the E.I. Railway. 8 annas per maund *plus* the rate from Calcutta to each of these stations, provided that the total rate is not less than .1 pie per maund per mile.

It was found that even with this specially reduced rates, only *reshta* from Sambhar could compete in Bengal market. Pachbadra and Khewra could not compete in spite of the specially reduced rates. Salt from Tuticorin and Karachi went to Bengal owing to cheap steamer freights.

The general conclusion was that though India as a whole had the capacity to produce all its requirements of salt, except for very limited special demands, or had this capacity, at least, if Aden was still treated as part of India, the dominating factor was the cost of transport. This could only be surmounted by the maintenance of some sort of protection at a high level. The difficulty was that the burden of such a measure must fall upon North-Eastern India while the advantages would go to quite different parts of India, and the greater advantage of all to a territory (Aden) which geographically, and politically, was not a part of India.

As a result of various schemes for the development of Salt industry in the country, due to liberalisation of the Gandhi-Irwin Pact (1931) in 1948 and as a result of the abolition of the restrictions imposed on private salt manufacture during Duty days (which was abolished from 1-4-1947), many new licensed and unlicensed salt works sprang up in the country mainly on the West Coast in Saurashtra and Kutch. The result was rapid increase in the production of salt in the country and by 1950-51 the country

not only became self-sufficient but began to export salt to foreign countries mainly to Japan. The figures of production, exports, etc. since 1947-48 are shown below:—

Year	Total Production (000 mds.)	Export (000 mds.)
1947-48	5,47,74	..
1948-49	6,38,40	19,20
1949-50	5,76,54	27,10
1950-51	7,10,46	31,02
1951-52	7,50,34	30,04
1952-53	7,83,92	76,74
1953-54	8,27,62	93,32
1954-55	7,73,38	53,53
1955-56	8,38,59	69,54

CHAPTER XXVI

RECENT COMMITTEES AND THEIR RECOMMENDATIONS

Many important and far-reaching developments have taken place in the Indian Salt Industry in recent years particularly since the partition when important rock salt sources of the Salt Range, the Kohat Salt Mines and the sea sources of Sind went away to Pakistan and the country was faced with a shortage. Different Committees were set up from time to time and a summary of the terms of reference and recommendations of these Committees are given below. It has also been mentioned how far these recommendations have been implemented and with what results. Committees appointed by State Governments have been given first.

I. Committees appointed by State Governments

Some of the State Governments have appointed various Committees from time to time to investigate and report on different aspects of the Salt industry in their States. A mention of some of these is made here.

A.—BENGAL

The Salt Industry Enquiry Sub-Committee (1941)

This Committee was appointed as a result of the recommendations of the Salt Survey Committee to undertake a detailed enquiry into the position of salt industry in Bengal and its prospects. The Committee was reconstituted twice and the final Committee submitted their report to the Government in September, 1944, and a few of their important recommendations were:—

- (i) All possible facilities should be made available to those who were producing salt under the Gandhi-Irwin Agreement on a Cottage Industry basis, and a close study of their working methods and organisation as would assist them.
- (ii) Adequate facilities and favourable conditions should be created to attract private initiative to start production of salt by solar, Burma or both the methods.
- (iii) Ancillary industries may be started for utilisation of the bitters for producing alkalies etc.

Report of the French Experts (1949)

The West Bengal Government got two French Experts in 1949 from Saline De Graud. They stayed in India for more than three months and studied various problems in Bengal in regard to salt. They submitted their report in 1951 and recommended the starting of a big factory on Contai Sea Board under solar evaporation. The cost of this was calculated by them at about Rs. 4 crores. In view of the over-production in the country as a whole and the scheme being too costly the State Government decided not to proceed with the same.

B.—ORISSA

Orissa Salt Manufacture Investigation Committee (1948)

In May, 1948, the Orissa Government appointed the Salt Manufacture Investigation Committee to conduct a proper investigation into salt industry in Orissa and to suggest suitable location, types of installations and the kind of organisation required for the manufacture of salt. The Committee submitted their report in 1948 and thought that there was no possibility of starting salt factories on the Balasore coast on an economical and commercial basis, but recommended Cuttack and Puri districts for salt manufacture. The Orissa Government appointed certain experts also from time to time to investigate the possibilities of salt manufacture in their State.

C.—SAURASHTRA

The Salt Industry in Saurashtra was revived only after the partition of the country in 1947. During this period itself, the State Government appointed the following Committees and are studying their recommendations:—

- (1) The Saurashtra Salt Experts Committee, 1949.
- (2) The Saurashtra Salt Experts Committee, 1952-53.
- (3) The Saurashtra Salt Works Labour Enquiry Committee, 1952.

Details of the Committees appointed by various State Governments have been given in the Chapters dealing with different salt producing States.

II. *Committees appointed by the Central Government*A. *Patel Committee (1947)*

Abolition of salt duty had been foremost in the Political Programme of the Congress Organisation since 1930. The Interim Government at the Centre, after the cessation of the Great War II, suspended the salt duty in their first budget (presented by Mr. Liaquat Ali Khan) with effect from 1-4-1947. In the meanwhile, the partition on 15-8-1947 brought about unprecedented communal disturbances and migration of population. The railway system was strained to the limit. Thus salt, which is carried in bulk-loads to the interior could not be carried on. This caused shortage in the inland areas. Consequently, the prices soared high and the consumers suffered. To add to this, natural causes affected the manufacture of salt in the West Coast areas and the import of rock salt from Khewra Salt mines was also affected considerably.

To meet the situation, the Government of India set up an inter-departmental Committee in 1947 under the Chairmanship of Mr. H.M. Patel, I.C.S., the then Cabinet Secretary, with the following members and terms of reference:—

Composition:—

- (1) Shri H. M. Patel, I.C.S., (Cabinet Secretary).
- (2) Shri K. K. Chettur (Commerce Department).
- (3) Shri K. R. K. Menon (Central Board of Revenue).
- (4) Shri G. A. Rowleson (Railway Board).
- (5) Shri Lobo-Prabhu (Food Department).
- (6) Shri S. Bhoothalingam, I. C. S. (Industry and Supply).
- (7) Shri Shiv Charan Das (Salt Adviser, Central Board of Revenue).

Terms of Reference:—

- (1) To submit an interim report on the measures necessary to meet the immediate problem of shortage of salt in various parts of the country; and
- (2) to make recommendations as to the organisation necessary for securing the maximum production and the most efficient distribution of salt at all stages.

The Committee submitted an interim report on the 27th August, 1947 on the measures necessary to meet the immediate problem of shortage of salt on short-term basis. Besides recommending specific measures for the immediate increase of transport, the Committee recommended the promulgation of an order under the Essential Supplies (Temporary Powers) Act to control distribution and fix the price of salt. As the duty on salt was abolished, the Ministry of Finance divested itself of its responsibility of production of salt and its distribution was handled by the Ministry of Food.

Owing to natural causes the West-Coast production fell off heavily and there was shortage of shipping space in India and overseas and so shipments to Calcutta fell. Sambhar supplies to Uttar Pradesh too fell into arrears to the tune of 33,000 tons owing to inadequate transport facilities. The breakdown of supplies from the Khewra salt mines aggravated the position. The Committee recommended that—

- (a) licences to import salt should be issued freely and the quantity should be shipped as early as possible;
- (b) the maximum quantity should be lifted from the Kathiawar ports and sent to Calcutta and a regular despatch of 90 wagons should be made from Sambhar to Uttar Pradesh and other areas;
- (c) stocks should be built up in all markets;
- (d) loading of salt should continue at Sambhar on Sundays too even, if necessary, by cancelling passenger train for making locomotives available for a short time;
- (e) salt should be supplied in Central Provinces (now Madhya Pradesh) from ports of Bhavnagar (Kathiawar) etc.;
- (f) an order should be issued immediately under the Essential Supplies (Temporary Powers) Act, 1946, which would give Government, among others power to direct (i) distribution of imported salt, (ii) to fix prices, whether throughout the country or limited areas, whether at all stages, wholesale, retail etc. or at any one or more stages; and (iii) to take suitable action against dealers and others who may hoard salt.

The above recommendations were based on short-term immediate requirements to relieve the strained conditions existing about October, 1947. The long-term recommendations of the Committee were given in the second part of the Report the synopsis of which is given below:—

- (i) *Nationalisation.*—The salt industry, of which the State was in direct control of about a third of the total production, should be brought more fully under State control in matters of quality, prices and distribution.

- (ii) The programme for future development should be based on the target of complete self-sufficiency in India's consumption of salt for human, animal and industry. The programme should be drawn on the basis of an eight-year period. In the first three years the target of production should be 2.2 million tons against 1.9 million tons at that time and the target at the end of the second period of five years should be 2.6 million tons per annum.
- (iii) Salt producing States were subject to a number of restrictions devised to safeguard the salt revenue of India and India in turn had to make annually large payments in the form of compensations. It was considered that fresh agreements might be made with those States where India Government desired to retain or obtain concessions to manufacture salt and with the States producing salt for large scale export under the rules in force to Indian territories.
- (iv) The Committee suggested that schemes should be formulated and steps taken to increase production and recommended the appointment of an Experts' Committee for the purpose.
- (v) They laid emphasis on improvement of quality and establishment of model Government salt works and salt refineries with a view to achieve this object.
- (vi) As regards distribution, the Committee in their first report recommended a system of nominated traders in certain areas. They also considered the question of establishment of Government controlled depots, but thought that it would not be of much value during normal times of easy transport facilities. They, therefore, suggested that the wholesale dealers and stockists should carry a stock at least equal to their average of two months' sales.
- (vii) The Committee considered it desirable to introduce price-control at various stages, like production, wholesale distribution and retail sale. They recommended that all sale of salt by measure as practised in Madras and Bombay should be terminated.
- (viii) The Committee felt that a control order would be necessary to implement its recommendation regarding production, distribution and prices of salt and it should give the Government powers to—
 - (a) direct distribution of imported salt;
 - (b) fix prices, whether throughout the country or over limited areas, whether at all stages wholesale, retail, etc. or at any one or more stages;
 - (c) take suitable action against dealers and others who may hoard salt; and
 - (d) direct stockists to keep at all times certain specified quantity of salt in stock.
- (ix) They felt that a self-contained Salt Act, including the relevant portions of Central Excise and Salt Act of 1944 should be enacted.
- (x) They recommended that the Government salt industry should be run on commercial basis keeping a margin of profit, say 6%.

- (xi) They further recommended that an all-India organisation with a Salt Controller as the executive head, to be assisted by a Financial Adviser and a Technical Officer should be established with regional offices at Madras, Bombay, Calcutta, etc.
- (xii) The Committee also suggested that instead of Finance, Industry and Supply Ministry should take over the responsibility for the Salt industry.

The Cabinet decided that a Committee consisting of the Industry and Supply Minister (as Chairman), the Finance Minister, the Minister for Transport and the Minister for Works, Mines and Power should consider the various reports and make recommendations to the Cabinet. This Committee approved the transfer of responsibility for production of salt from Finance and the responsibility for distribution and price control from Food to the Industry and Supply Ministry and also made the following observations:—

- (i) While examining the review of stock and supply position in the different areas, the Sub-Committee recommended that it should be verified whether any salt was being sent from Calcutta to East Bengal and, if so, how much.
- (ii) The Sub-Committee recommended that licenses should not be issued for import from the dollar area. Applications for import licences should be routed through the Industry and Supply Ministry for watching results.
- (iii) The Committee expressed the view that in opening up salt sources not being worked till then in Jaipur and Jodhpur States and even in other States, the possibility of collaboration between the States and the Government of India should not be neglected. They further recommended that an effort should be made through the States Ministry to terminate compensation to the States with effect from 1-4-1948. Salt produced in States should be allowed to be sold in India only if it was of the standard quality.
- (iv) Reduction of number of daily wagon despatches from Sambhar Lake should be taken up again as soon as the salt position in Uttar Pradesh and East Punjab became secure.
- (v) The Sub-Committee recommended further that in connection with the implementation of long term proposals, an expert in Salt manufacture should be included in the Committee to be formed for this purpose.
- (vi) The Committee recommended that in determining the targets of production the requirements of cattle should be worked out separately and kept in view.

These recommendations were accepted by the Cabinet early in December, 1947.

As a result of the recommendations of this Committee the present organisation of the Salt Department under a Salt Controller (now Salt Commissioner) as its executive Head was established on 1-11-1947. As one of the recommendations was to set up a Committee of experts, a Committee known as the Salt Experts' Committee was appointed by the Government of India in 1948.

B. Salt Experts Committee (1948-50)

As stated above this Committee was appointed by the Government of India *vide* their Resolution No. Salt-18(1)-I & S./48, dated the 15th April, 1948, as a result of the recommendations of the Patel Committee. The following were the personnel and the terms of reference of this Committee:—

Shri P. A. Narielwala	Chairman.
Dr. K. L. Moudgil	Member.
Shri M. D. Mithal	Member.
Shri Shiv Charan Das	Member.
Dr. B. Shah	Secretary.

Terms of Reference.—The Committee was set up in order to advise Government on the measures necessary to place the Salt industry in India on a sound footing. The terms of reference were—

- (i) To examine the existing methods of salt production in Government and private-owned salt works, and to make recommendations as to what steps should be taken to increase production, to improve quality and reduce costs; where possible to give an estimate of the costs involved in increasing production and improving quality.
- (ii) To indicate the areas in which new salt works may be established with advantage and the technical standards which should be prescribed for these works.
- (iii) To examine and report on the best method of enforcing minimum standards of quality of salt offered for sale and methods to prevent wasteful production of salt below such quality.
- (iv) To report on the necessity and/or usefulness of model factories to guide production and to give concrete proposals for their establishment.
- (v) To report on the character and extent of the technical assistance and supervision which must be provided to private salt works to enable them to increase the quantity and improve the quality of production. Should Government itself maintain a permanent technical staff for the purpose; if so what should be the qualifications and experience of such staff?
- (vi) To report on the desirability and possibility of establishing, whether under State control or otherwise, modern installations for the production of salt otherwise than by solar evaporation, particularly for the manufacture of high quality edible salt, salt for industrial use and by-products of salt. For this purpose an assessment should be made of the industrial requirements of salt and the production of such requirements which the consuming industries can economically buy from outside sources.

As usual, in order to collect full and up-to-date information, the Committee issued a detailed questionnaire to the salt companies, State Governments, Salt Merchants' Associations and gathered a considerable amount of useful information. They then visited 25 important salt producing areas in the country, namely, the Marine Salt Works on the sea board of India, the Inland Salt Works in Rajasthan and other areas and the Rock Salt

Mines in Mandi. The Committee dealt with different salt sources exhaustively and made recommendations in regard to each. They emphasised the importance of achieving self-sufficiency in salt. The Committee discussed the technical aspect of the industry in order to give information and the conditions prevailing in different parts of India and suggested methods by which quality and yield could be improved. The Committee also dealt with cost of production, the selling prices, suggestions for reducing the price and improving the quality. They also indicated how the Salt Department of the Government of India should function and the help it should render to the industry by establishing model factories and research stations. The Committee also discussed the need for laying down proper standards of quality of edible salt and the dates by which the standards should be enforced. The Committee in all made 286 recommendations relating to—

- (1) general principles for the production of solar salt on scientific lines;
- (2) improvements to be effected in the Government Salt Works of Sambhar, Didwana, Pachbadra and Kharaghoda;
- (3) development of the Mandi Salt Mines;
- (4) improvements in the private salt works of Saurashtra, Kutch, Bombay, Travancore, Madras, Orissa and West Bengal;
- (5) investigations to determine the possibility of salt production in Bharatpur (Rajasthan), Great Rann of Kutch and Sultanpur (Punjab);
- (6) general problems concerning the Salt Administration of the country;
- (7) establishment of model factories and research stations; and
- (8) control of quality.

The Government of India examined these recommendations and had accepted 119 recommendations up to 1951. The more important of the accepted recommendations were:—

- (i) Calibration of Beaumo hydrometer to suit Indian conditions.
- (ii) Investigation of the possibility of tapping subterranean brine in places where rainfall is high.
- (iii) To discourage the process of manufacture by artificial evaporation in open pans and to have recourse to the Vacuum evaporator system for producing salt of high grade variety.
- (iv) To ban the sale of salt by measure.
- (v) To abolish the system of marketing salt through the registered dealers at Sambhar and Kharaghoda.
- (vi) To increase the advances to the Kharwals for the renovation of the salt pits at Pachbadra.
- (vii) To carry out a geological survey of the Mandi Mines with a view to locating fresh deposits of rock salt.
- (viii) The offer made by Messrs Escher Wyss & Co. of Switzerland for determining the best method of exploiting the Mandi salt deposits and drawing up a general lay-out and plan for a suitable evaporator plant at a cost of Rs. 12,000 should be accepted and they may be asked to submit their recommendations as early as possible.

- (ix) To consider the possibility of saving the Kandla salt works from being acquired on account of the development of Kandla as a major port.
- (x) To continue the Zonal System of distribution as already introduced by the Salt Department and to effect adjustments wherever necessary to reduce the maximum lead to 750 miles.
- (xi) To suspend payments under treaty rights to the States as compensation for suppression of salt manufacture, etc.
- (xii) To set up a Salt Advisory Committee representing the Government, manufacturers, consumers and importers.

The following are some of the important recommendations which are still under the consideration of Government:—

- (i) To modify the present organisation of the Salt Department into a Development Department.
- (ii) To levy a uniform cess of -/1/- per maund on all salt produced in the country or imported from outside.
- (iii) The heavy chemical industry, especially the alkali industry, should be allowed a rebate equal to the cess collected on the salt it actually consumes.
- (iv) The management of Government salt works should be entrusted to a Statutory Corporation in order to obtain satisfactory control and supervision of these works. Such a Corporation should be jointly owned by the Governments of India and Rajasthan.
- (v) The present terms under which licences for the manufacture of salt are issued are rigorous and should be revised and simplified.
- (vi) To adopt a simplified procedure for collection of cess and to reduce the present elaborate staff for collection.
- (vii) Consolidation of small holdings into economic units or expansion into economic units and their realignment.
- (viii) To set up model factories in principal salt producing centres.
- (ix) To raise the minimum sodium chloride content as prescribed in the draft specifications of the Indian Standards Institution from 96% to 97.5% and to prescribe the maximum permissible limit for the common impurities present in the salt.
- (x) To collect samples systematically from the various factories and to have them analysed and to denature or destroy any salt found to be below the standard.

C. Salt Advisory Committee

The Salt Advisory Committee was constituted as a result of the recommendations made in the interim report of the Salt Experts Committee submitted in June, 1948. The recommendation was as follows:—

- (2) "Steps should be taken to appoint a Standing Salt Advisory Committee to advise Government on (a) Production, (b) Distribution, (c) Imports, and (d) Exports of salt. This Committee should consist of representatives of the Ministry of Industry and Supply, Commerce and Transport, as also of manufacturers, consumers and importers."

The Committee was constituted *vide* Government of India Resolution No. Salt-18(8)/48, dated the 30th August, 1949 and had the following personnel:—

1. Shri R. K. Sidhwa, M.P.—Chairman.
2. Shri L. K. Moitra, M.P.—Member.
3. Shri B. Das, M.P.—Member.
4. Shri A. Vedaratnam Pillai (M.L.A. Madras)—Member.
5. Shri P. A. Narielwala—Member.
6. Shri Ardeshir H. Bhiwandiwalla—Member.
7. Shri S. Ramaswamy—Member.
8. Shri Saroje Kumar Dutta—Member.
9. Dr. J. N. Ray—Member.
10. Shri S. N. Chinnakannu Pillai—Member.
11. Deputy Secretary, Ministry of Industry and Supply—Member.
12. Salt Controller—Member-Secretary.

It was felt in 1951 that the Committee to be of any use should be reconstituted and the members should be in the representative capacity and should be nominated by the Associations, such as, the Madras Provincial Salt Industrialists' Association, Bombay Salt Manufacturers and Shilootries Association, Indian Salt Manufacturers' Association, Bombay, Calcutta Salt Association, Tuticorin Salt Manufacturers' Association, etc. It was also felt that there should be a member to represent the interests of the Labour. The Committee was, therefore, reconstituted in March, 1952 as follows *vide* Government of India Resolution No. Salt-18(8)/48, dated 6-3-1952. It has 20 members (including the Chairman) and has representatives of the Salt Manufacturers' Association in different parts of India as follows:—

1. Secretary of the Ministry of Works, Production and Supply (now Production)—Chairman.

MEMBERS

2. Deputy Secretary, Ministry of Works, Production and Supply (now Production).
3. Industrial Adviser, Ministry of Commerce and Industry.
4. Salt Controller (now Salt Commissioner)—Member-Secretary.
5. A representative of the Government of Bombay.
6. A representative of the Government of Madras.
7. A representative of the Government of Saurashtra.
8. A representative of the Government of West Bengal.
9. A representative of the Government of Orissa.
10. A representative of the Government of Andhra.
11. A representative of the Government of Travancore-Cochin.
12. The Director of Central Salt Research Institute, Bhavnagar.
13. A representative of the Indian Salt Manufacturers' Association, Bombay.
14. A representative of the Bombay Salt Merchants and Shieotries Association, Bombay.

15. A representative of the Uran Salt Merchants and Shilotries Syndicate, Bombay.
16. A representative of the Madras Provincial Industrialists' Association, Madras.
17. A representative of the Salt Manufacturers and Merchants' Association, Tuticorin.
18. A representative of the Calcutta Salt Association Ltd., Calcutta.
19. A representative of the Indian Chemical Manufacturers Association, Calcutta.
20. A representative of Labour Employed in the Salt Industry.

The functions of the Committee are to advise Government on all matters referred to it concerning, in general, the development of the Indian Salt Industry on rational lines, and in particular, the attainment of increase in production, improvement in quality, reduction in costs and prices, efficiency in distribution and increased exports to foreign markets.

The Committee holds its meetings at different places, which are decided by the Committee. The last meeting was held in Delhi in December, 1954.

D. Salt Research Committee

The Chairman of the Salt Experts Committee (Mr. P. A. Narielwala) after the visit of the Committee to Sambhar Lake sources, brought to the notice of the Governing Body of the Council of Scientific and Industrial Research the scant attention paid to the problems of research at this source and its untapped vast potentialities. The Board of Scientific and Industrial Research, therefore, in their meeting held on 17th July, 1948, under the Chairmanship of the Hon'ble Shri Jawaharlal Nehru, constituted a Salt Research Committee to examine, *inter alia*, these problems with the following as members:—

1. Dr. Mata Prasad, Principal, Royal Institute of Science, Bombay—Chairman.
2. Mr. P. A. Narielwala, Tata Chemical Industries—Member.
3. Dr. K. L. Moudgill, Deputy Director, Indian Standards Institution—Member.
4. Mr. B. S. Lalkaka, Director, Pioneer Magnesia Salt Works, Bombay—Member.
5. Mr. D. N. Mukerjee, Salt Controller to the Government of India—Member.
6. Mr. Shivcharan Das, Member, Salt Experts Committee—Member.
7. Dr. D. N. Wadia, Director, Indian Bureau of Mines—Member.
8. A representative of the Mettur Chemical and Fertilizers Ltd., Mettur (South India).
9. The Director, Council of Scientific and Industrial Research (then Dr. S. S. Bhatnagar).

Shri Shiv Charan Das resigned, Mr. D. N. Mukerjee and Dr. D. N. Wadia were replaced by Shri S. C. Aggarwal, Salt Commissioner and Dr. B. Rama Rao, Director, Bureau of Mines. Mrs. E. McBain, (wife of Dr. McBain, Director of the National Chemical Laboratory, Poona) was appointed a member of the Committee.

The Mettur Chemical Works was represented by Shri S. Ramaswamy.

The following were the terms of reference of the Committee:—

- (i) To examine the present methods of production of salt and suggest improvements thereon with the object of stepping up production of salt in India for domestic as well as industrial uses.
- (ii) To explore natural deposits of salt such as those occurring in Rajputana and to suggest measures for their beneficiation.
- (iii) To fix the standards of purity of salt for use in different industries and to suggest and work out methods of purification.
- (iv) To find out suitable methods of making salt on a small scale so that people who were near to the sea and to the salt deposits could make salt.
- (v) To investigate the nature of by-products obtained in the manufacture of salt and work out methods for their separation.
- (vi) To undertake investigations and to recommend the institution of schemes of research in furtherance of the above objectives and to co-ordinate the research.
- (vii) To include in its programme of work the utilisation of the various salts from sea-water for making chemicals.

The Committee has held three meetings so far and is engaged on co-ordinating research and collecting data. At one of their meetings it was decided to have three Research Stations. It was, however, ultimately decided that to begin with a Central Salt Research Station should be established and located at Bhavnagar in Saurashtra. This Central Salt Research Institute was established in April, 1953. This is operating under the guidance of the Council of Scientific and Industrial Research and is conducting researches in salt.

E. Central and Regional Boards

It was felt by the Government of India and also demanded by the industry that the proceeds of the Salt Cess should, after meeting the establishment charges, be utilised for the development of the industry. It was, therefore, decided under Section 4 of the Salt Cess Act, 1953, by the Government of India, Ministry of Production *vide* their Resolution No. 9/1/54-Fy.II, dated 11-10-1954 to constitute a Central Board and six Regional Boards in salt producing areas of (i) Madras, (ii) Andhra, (iii) Travancore-Cochin, (iv) West Bengal and Orissa, (v) Saurashtra and Kutch and (vi) Bombay. The functions of the Central Board are to advise the Government of India on the administration of the proceeds of the Salt Cess levied and collected under Section 3 of the Salt Cess Act 1953. The functions of the Regional Boards are to make recommendations to the Central Board regarding measures for—

- (i) the establishment and maintenance of research stations and model salt farms;
- (ii) the establishment, maintenance and expansion of salt factories;
- (iii) fixing the grades of salt;
- (iv) promoting and encouraging co-operative effort among manufacturers of salt; and
- (v) promoting the welfare of labour employed in the salt industry.

The Central Board consists of:—

Joint Secretary, Ministry of Production—Chairman.

Two representatives from the Governments of the salt producing States, who are represented on the Salt Advisory Committee to be nominated by rotation—Members.

Two representatives from the manufacturers, who are represented on the Salt Advisory Committee to be nominated by rotation—Members.

One representative of labour, who is also represented on the Salt Advisory Committee—Member.

One representative of the Ministry of Natural Resources and Scientific Research—Member.

Deputy Secretary, Ministry of Production concerned with the administration of 'Salt'.—Member.

Two non-officials to be nominated by the Government of India—Members.

Salt Commissioner, Member-Secretary.

The Regional Boards consist of:—

Salt Commissioner—Chairman.

A representative of the State Government of the Region—Member.

Two representatives of labour, one to be nominated by the Central Government and the other by the State Government—Members.

Two representatives of the Salt Manufacturers—Members.

Two non-officials to be nominated by the Government of India—Members.

Deputy Salt Commissioner of the Region—Secretary.

The personnel of the Central and Regional Boards was announced in 1955 and each of these Boards have held two meetings in various Regions.

F. Indian Taxation Enquiry Commission (1953-54)

The Indian Taxation Enquiry Commission was appointed by the Government of India in 1953. This Commission *inter alia* examined the question of re-imposition of duty on salt also, but did not recommend the re-imposition. They observed "Considering the increase that has occurred, and may occur hereafter, in commodity taxation, a tax on salt cannot be justified merely on the ground that its incidence by itself is relatively light."

CHAPTER XXVII

HISTORY OF SALT REVENUE IN INDIA.

Salt revenue in India has had a chequered career. A detailed history of salt revenue would form a book by itself, consequently the salient features of its history are given in an outline only. The salt revenue followed different lines in different provinces up to 1870 and so up to the seventies it has been given province by province. Since after this period Government adopted a general policy, all provinces may be advantageously studied together.

I.—UP TO 1870

A.—BENGAL

Under the Mohammedan rule, a revenue was realized by means of imposts on the privilege of manufacture and by transit duties on its transportation from the places of manufacture to the interior of the country. The duties were generally farmed and according to Sir John Macpherson, "the farmers had the entire salt trade in their hands". The coming of the English on the scene practically coincided with the fall of the Moghul power. The Diwani (or the right to levy tax) of Bengal, Bihar and Orissa was granted to the East India Company in 1765. With the grant of Diwani the Company got influence and power and established its economic prestige long before political power came into its hands. In 1765 Lord Clive, the then Governor General, wanted to establish a society of trade for Salt, Betelnut and Tobacco and to monopolise the sale of these articles, but this was not approved of by the Court of Directors. The Company, therefore, substituted excise for monopoly, but as the revenue was falling, Warren Hastings was driven to tighten up the reins of salt administration and adopt the monopoly of manufacture. All salt was delivered to Government at a fixed price and Government sold it at a fixed price. This did not improve revenue and in 1780 Warren Hastings introduced the Agency system. Under this system a Comptroller and several civil officers of rank were appointed as salt agents of the Company. Salt was manufactured by the manufacturers called "Molunghees" under the directions of the agent and was sold to him at a fixed price. The agent stored salt and distributed to wholesale dealers at a fixed price, the difference of Rs. 1-2-0 to Rs. 1-8-0 a maund constituting salt revenue to the Company. This improved revenue which, as Mr. Plowden says, "rose from £8,427 in 1780-81 to £4,57,687 in 1786-87". According to Mr. Plowden there were two reasons for the institution of this monopoly, (1) Improvement of Revenue, and (2) Emancipation of 'molunghees' from the clutches of the Indian capitalists. The first purpose was achieved, but the condition of the molunghees did not much improve. Attempts were made to improve their condition by introducing a surplus system under which a higher payment was made for the salt manufactured by them over the quantity stipulated. The system was, however, abolished as the stocks in hand increased immensely. Later on Lord Cornwallis started a system of auction sales instead of selling at fixed price. This, however, gave rise to a sub-monopoly of salt in the hands of Indian capitalists and the consumer suffered a lot.

Salt laws of those days were of unusual rigour. Besides the actual illicit manufacturers, the zamindars on whose lands illicit manufacture of salt took place were held responsible. This was under the 1778 Salt

Rules and the Regulation of 1793. Smuggling and illicit manufacture of salt were, however, common. The Company's monopoly was very unpopular. The Court of Directors in all their Despatches and orders took a different view and wanted to cheapen salt. Up to 1818 the import of English salt was prohibited and till 1830 was subject to a high import duty and penal bonding regulations, which evoked a powerful agitation from the English manufacturers. The result was that the Committee of Lords in 1830 and the Select Committee of the House of Commons, in 1832, went into the East India Company's affairs. The Company's Charter was renewed in 1833, but the Charter remained a dead letter so far as the closing of the commercial business of salt monopoly was concerned. Allegations of dear and adulterated salt were made before the Committees. They, however, did not abolish the monopoly since there were then no other means of raising the revenue it yielded. In 1836 a Select Committee was appointed to enquire into the salt supply of British India. They recommended that the monopoly should at least be reduced to a monopoly of manufacture and stated that they hoped to see it replaced by a combined system of Customs and Excise under which other parts of India might get a share of the supply. As a result, the system of auction sales was abolished and Warren Hastings' system of fixed price sales of unlimited quantities reverted to.

The quantity sold under the Company's monopoly amounted to about 1,80,000-1,90,000 tons. The duty on salt was abolished in England in 1825 and hence the salt industry there received a great impetus and foreign salt began to come to Bengal mostly as keel ballast. The cost of production of salt in Bengal was very high, as much as Re. 1 a maund, and so foreign salt began to come in greater and greater quantities. In 1843 the Court of Directors laid down the principle of price fixation under which the net salt revenue was to be maintained at its present amount, the duty to be imposed not to exceed the average rate of net profit of the Company's monopoly for the previous ten years.

Lord Dalhousie in 1851-52 recommended reduction of the selling price of local salt in order to check the rising tide of foreign imports. The Charter of the Company was renewed in 1853 and under the new Charter the Company was ordered to give up all commercial business and the manufacture and sale of salt were made free but subject to an excise. The position of the monopoly was shaky and a special officer, Mr. Plowden, was appointed to report on the salt industry. He recommended excise, but monopoly, being a hardy growth, vanished only gradually. Excise system could not stand competition with imported salt. Imports increased enormously. The duty which was Rs. 3-4-0 in 1817 was reduced to Rs. 3 in 1844, to Rs. 2-12-0 in 1847 and to Rs. 2-8-0 in 1849, but was again raised to Rs. 3 after the Mutiny of 1857. Mr. Plowden recommended Rs. 2. The local industry gradually lost ground. Agencies were closed in 1863 and the 'molunghees' suffered great hardships in the Orissa famine of 1866. The Cheshire salt by its superior quality and cheapness soon ousted the local product. The manufacture of local salt remained subject to Excise till 1898 when it was prohibited altogether. During the War days (1914-1918) attempts were made to revive the local manufacture but failed. A system of retail sales at reduced prices from shops established on behalf of Government in areas peculiarly exposed to smuggling existed in Bengal for many years, but was abolished in 1862 when the full rate of duty was for the first time levied uniformly throughout the province. After the Mutiny the duty was raised to Rs. 3 in 1859 and further to Rs. 3-4-0 in 1861. Subsequent history of Salt revenue in Bengal is given in the general section.

There was very little salt revenue in Madras before 1805. The manufacture was either farmed out or managed by officers of Government, upon what system the records do not clearly show. Sometimes the pans were farmed out, sometimes revenue posts were established and transit duty levied, and sometimes the produce was divided. On an average the gross revenue from salt prior to the monopoly is said to have been about Rs. 2,20,000. It was in 1802 that the East India Company by Regulation XXII reserved to itself the exclusive privilege of manufacturing salt. The Government established a monopoly of manufacture and sale of salt by Regulation 1 of 1805. This was extended to Malabar and Kanara in 1807. According to the Madras Salt Commission of 1876, "the salt revenue in Madras can hardly be said to have a history before the establishment of the Government monopoly". Mr. Plowden in his report on salt industry in 1856 mentioned that the monopoly was designed to meet the expenses of new Judicial establishment. In the beginning, a general agent was appointed at the head of Collectors, but in 1808 the Collectors were placed under the Board of Revenue on a Commission basis. Production by manufacturers was subject to Government control and they had to sell all salt to Government at a fixed price. The Government then sold it to dealers at a profit. The sale of salt to any persons other than Government Collectors was made illegal. The Zamindars who manufactured or connived at clandestine manufacture of salt on their land were also liable to punishment. In the beginning the Company opened warehouses in many parts of the country so as to enable people to purchase salt at Government prices.

In 1809 the price including cost of production, duty, etc., was Rs. 105 per garce (120 maunds). It was reduced to Rs. 70 per garce in 1820. It continued at this rate till 1828 when it was raised to Rs. 105. This rate continued till 1843. In 1844 the Government of India abolished the transit duties and raised the price of salt to Rs. 180 per garce or Rs. 1-8-0 a maund, but the Court of Directors reduced it to Re. 1 a maund. In Malabar and Kanara the prices were at a higher level. Sales of Government salt in 1807 were 34,14,560 maunds and in 1870, 65,01,638 maunds. Imports of foreign salt were prohibited in Madras up to 1818. Then they were permitted, but an import duty of Rs. 3 a maund was levied. This was reduced to twelve annas under orders of the Court of Directors in 1851. The foreign salt, however, did not find favour with the Madras consumer and the salt magnates of England kept on agitating against the Madras salt monopoly. The outcome of this agitation was the appointment of the Madras Salt Commission of 1876.

An abundant quantity of spontaneous salt formed in marshy swamps and earth salt was produced in saliferous tracts. In Bellary and Kurnool a tax was levied on the manufacture of earth salt under the head of 'Moh-turfa'. The 'modas' or hillocks were worked by animals or manual labour and were classed and manufacture taxed according to the number of men or cattle employed on each 'moda' or mound of earth put to use. The tax was on a licensing basis. In 1869 the manufacture of earth salt was permitted in selected places only, compensation being paid to those who agreed to stop manufacture. The Madras Salt Commission recommended stringent measures and total suppression, but these recommendations were not adopted.

A redeeming feature of the Madras salt monopoly as compared to Bengal was that it did not contribute to the deterioration of the quality of the salt, very probably because of the absence of the institution of auction

sales, and its accompaniment, the sub-monopoly. The consumer was thus supplied with an article which was comparatively cleaner. Here anyone could purchase salt from Government stocks at a fixed price. The monopoly system continued till after the Charter of 1853 when Mr. Plowden was appointed Salt Commissioner to enquire into the system of salt administration. According to him monopoly was defended only on the ground that the same amount of revenue could not be raised so cheaply and with so little inconvenience to the community in any other manner. He recommended Excise—a system of licensing in suitable localities. The Madras Salt Commission of 1876 also recommended Excise. They said, “We regard it as the most hopeful means of giving to the Madras Presidency the share in the trade for the supply of other parts of India and Burma and adjacent countries which its natural advantages and geographical situation should enable it to command. We therefore recommend that steps be taken for the introduction of Excise”. Excise system, however, was only gradually introduced. By 1877, 87 per cent of salt was produced under Excise system and sold from 6 to 14 annas a maund. Some monopoly factories, however, still continued to secure a reserve of supply against shortage and secondly as a safeguard against undue fixing up of prices by manufacturers. The Modified Excise system, under which the licensee ordinarily manufactures for his own sale, but may be required at any time before the beginning of the season to sell the whole or a portion of his salt to Government at a fixed price, was also in force.

For many years the price of salt under the monopoly system was fixed at Re. 0-2-0 maund. In 1877 it was at Re. 0-3-0 per maund which continued till 1905. Government stocked salt to control the prices which they wanted to keep as low as possible. Up to 1844 the duty was not kept separate from the price. The rate was then amalgamated and quoted at so many rupees per garce. As already stated the rate in 1844 was kept at Re. 1 a maund. It was raised to Rs. 1-2-0 in 1859, to Rs. 1-6-0 in 1861, to Rs. 1/11/0 in 1866, and to Rs. 2 in 1869. About this time the Government of India adopted a policy of equalization of salt duty throughout India which is dealt with in the general section of this chapter.

C.—BOMBAY

The salt revenue administration engaged the attention of the authorities in Bombay much later than in other provinces. According to Mr. Peddar, an officer on special duty, “A regular Excise upon salt in Bombay dates only from 1838”. Previous to 1836, the Collectories of Ahmedabad, Kaira, Bombay, Surat, etc., had different systems of management and collection of salt duty. Some works were owned by Government which sold the salt. Government rented some works and got rent. A duty was levied on the produce of some private salt works, sometimes a Custom duty was levied on the import and export of salt by sea and transit duty was levied in land. Sometimes a land revenue was assessed on some pans and a quit rent was levied on others. The whole scheme was incomprehensible—the revenue realised under these different systems was small, being Rs. 2,35,242 only in 1836-37. The idea of establishing a salt monopoly was first mooted about 1816, but the Court of Directors considered the proposal premature in the then unsettled state of the Bombay Presidency and did not agree to it. Mr. Bruce, a member of the Bombay Customs Committee, suggested the abolition of transit and town duties in favour of an excise levy of Re. 0-6-4 on salt in 1825. The Government of India, however, did not agree to the abolition of transit duties. The Customs

Committee then recommended an excise duty of Re. 0-8-0 a maund on salt to make up for the loss of revenue consequent on the abolition of transit duties. This was put in force by Act 27 of 1837 under which pans were licensed, illicit manufacture penalized, transit duties abolished and an excise duty of Re. 0-8-0 levied on salt before its removal from works. The amount realised from salt duty at that time was about Rs.14 lakhs. The town duties were abolished in 1844 and the duty enhanced to Re. 0-12-0 a maund. The defect of these salt duty laws was exceedingly beneficial to the inhabitants of the Presidency. Mr. Peddar in his report of 1870 said, "A simple, indirect and far from oppressive tax was substituted for a system of taxation from the times of the Mahrattas, which formed an intolerable burden upon trade and industry and in the words of Plowden was so full of inequalities, anomalies and complications that it would be almost vain to inquire from what objections and abuses it was even free". Later on, the Act of 1837 was replaced by Act 31 of 1850 for the better protection of salt revenue. Illicit manufacture was prohibited under its penal provisions. Preventive lines had already been raised in 1836 dividing Gujerat from Kathiawar and Marwar so as to keep out of Gujerat, northern salt and that naturally produced in the Rann. Preventive lines against the Portuguese territories were raised in 1840. Mr. Plowden in 1856 recommended reduction of duty to Re. 0-8-0. He considered that the higher the duty, the greater was the temptation for smuggling. According to him reduction of duty was the only key to stop smuggling and illicit traffic in salt. The Government of India, however, raised the duty to Re. 1 in 1859 and then to Rs. 1/4/0 in 1861 to meet the post-mutiny deficits in finances. The duty on salt in Bengal at this time was as high as Rs. 3-4-0. The Government of Bengal believing that Bengal was forced to subscribe much more than its due and legitimate share to the Imperial Revenues pressed for equalization and raising of duty in Bombay and Madras. Hence in 1864 the duty was raised to Rs. 1-8-0. The revenue increased and the Government of India with a view to equalize the duty all over India pressed for a further increase. Further history after the seventies is given in the general section.

Madras dealt with the problem of salt manufactured in the Non-British European territories, viz., French Settlements, by treaties and compensations, but Bombay allowed its Non-British territories to manufacture salt against which there existed a preventive line.

D.—BURMA

Under the Burmese regime, duty on salt was levied except in Shwebo and Lower Chindwin Districts. The Burmese levied a tax of 7 annas for the season on every pot of which a kiln was composed and also a 'ghaut' tax or transit duty of 4 annas per 100 viss at the 'ghaut' from which the salt was embarked. According to Mr. Plowden salt was manufactured in Burma, but export to Bengal was stopped. The manufacture was free subject to an excise which was levied per earthen pot or iron cauldron. Duty in various parts varied from Re. 0-8-0 to Re. 1 per earthen pot and from Rs. 2/8/0 to Rs. 5 per iron cauldron. The gross revenue in 1853-54 was Rs. 14,263.

Between 1876 and 1882 duty on salt was levied under the Lower Burma Land and Revenue Act which empowered the Chief Commissioner to levy a duty on manufactured salt not in excess of the Customs duty in force at that time.

The Burma Salt Department was formed after the annexation of Burma by Lord Dufferin, when a duty of Re. 0-3-0 a maund was levied. From 1854 to 1888 the Customs duty was 3 annas per maund; Excise duty the same, while the Composition rates varied from Re. 1 to Rs. 5 per cauldron. At the suggestion of Mr. Ashton of the Northern India Salt Revenue Department deputed to report on the Burma Salt Industry, the Composition duty levied as a composition fee on manufacture was raised, but it did not come to the level of the Customs duty with the result that the local industry flourished and foreign imports declined. From 1888 to 1916 the Customs duty was Re. 1 with various rates of Composition duty, all well below Re. 1 per maund. In 1902 the Excise duty in Hanthawady and Bassein districts was reduced to 8 annas, this low rate being in later years extended to Myaungmya, Tavoy, Mergui, Amherst and Kyaukpyu. In 1911, the Excise duty was raised to 10 annas, in 1914 to 12 annas and in 1916 to Re. 1, the Excise duty in the last mentioned year being raised to the level of the Customs duty, namely, Rs.1-4-0 and thereafter the Burma rates followed those in India. The Composition duty rates in Upper Burma were lower. The cost of production was high and if full duty were levied the industry could not get on at all.

Duty on imported salt was first levied under Act 30 of 1854. A Customs duty of Re. 0-8-0 a maund was leviable on salt imported by sea into any part of Arakan, Pegu, Martban, and this was reduced to Re. 0-3-0 in 1865. By the Indian Tariff Act of 1875, the rate of duty was kept at Re. 0-3-0 and was raised to Re. 1 in 1888. The Import duty in Burma and Bengal was levied under Section 3 of the Indian Tariff Act, 1894, at the rate at which Excise duty was levied under Section 7 of the Indian Salt Act of 1882.

E.—NORTHERN INDIA

In Pre-British days Northern India got its salt either locally by lixiviation of salt earth or from the Salt Range mines and quarries or from the Rajputana Salt Sources. The Mohammedan Rulers raised revenue from salt by means of imports on the privilege of manufacture or by transit duties known as "sayer" on its transportation from places of manufacture to the consuming markets, which were levied by Mohammedans at the rate of $2\frac{1}{2}$ per cent *ad valorem* and from Hindus at 5 per cent. The East India Company got the Doab District in 1801. The earliest regulation for the collection of Customs taxes (which included salt duty) in Upper India was No. XXXVIII of 1803 and under that Regulation salt was taxed according to quality at varying rates. The Company first set up a system of monopoly by agents who advanced money to licensed manufacturers on the stipulation that the salt made would be delivered to the Company at a certain price. Salt was then sold to merchants by public auction. This system prevailed only for a few years. By 1804 it had been replaced by imported salt and on salt produced in the conquered districts. This duty was collected at Custom Houses which had been established throughout the North-Western Provinces for the collection of the Inland Customs duties imposed on various articles in substitution for the native system of "sayer". In 1810 in place of the uniform duty of 12 annas a maund variable duties were imposed, i.e., Re. 1 on Lahori, Sambhar and Didwana salt, 12 annas on Bharatpur, 8 annas on Gurgaon and 4 annas on other kinds of salt. This system of taxation, namely the levy of duty at the principal Inland Customs stations, gave rise to great abuses and between 1823 and 1834 the Inland Custom houses and *chaukis* were abolished and

their place taken by a line of *chaukis* on the frontier, the manufacture of alimentary salt from salt earth or well brine being prohibited in the interior of the province.

A double line of Customs posts on the frontier and on the Jumna was established in the Delhi territory. At the suggestion of Sir Charles Trevelyan, the Government of Lord William Bentinck abolished the transit duties the evils of which were well recognised and substituted for them a system of import and export duty to be collected on the North-West Frontier of British Territory within which manufacture of alimentary salt was prohibited. This is how the great Inland Customs Line started. In 1843 the duty on imported salt was fixed at Rs. 2 per maund. The whole establishment was concentrated on the single line divided into Beats. The line began from the Himalayas and ran parallel to the river Jumna along its right bank through the districts of Ambala, Karnal, Delhi and Gurgaon in the Punjab and to the U. P. districts of Mathura, Agra and Etawah. Thence it was carried along the southern Frontier of Allahabad and Mirzapur Districts to the Son River where it ended. A branch line ran from Ballabgarh in the Delhi district along the northern border of the Jhajjar territory by Hansi and Hissar to Fazilka on the Sutlej to tax salt from Rajputana. The revenue which was about rupees 22 lakhs in 1823 rose rapidly to Rs. 47 lakhs in 1843. On the annexation of the Jullundur Doab, the branch line from Delhi to Sutlej became the main line; when the Punjab was annexed after the Sikh Wars in 1849, it was extended up the Sutlej to a point in the Indus opposite Mithankote. Under Sikh Rule, salt was one of the 48 articles liable to customs, town and transit duties. Mines and quarries had been farmed out and the farmer disposed of his salt as he liked. His price and transit duties were very high. Lord Lawrence in his evidence before the Select Committee on East India Finance in 1873 deposed that under the Sikhs the levy amounted to Rs. 1-8-0 a maund. The British Government abolished the transit duties and fixed Rs. 2 a maund as price and duty. The quarries in Kohat were given to local chieftains on payment of tribute. Very light duties of Re. 0-2-0 to 0-4-0 a maund were levied on Kohat salt.

The Commissioners of the Rawalpindi and Multan Divisions, were in charge of revenue and preventive lines along the Indus and Sutlej respectively. In 1855-56 certain portions of the Central Provinces were brought within the line and a uniform duty of Rs. 2-8-0 was fixed for all salt crossing the line. The duty was raised to Rs. 3 in 1861. In Bengal it was Rs. 3-4-0 at this time.

About this time (1867) the Inland Customs Department was at its zenith. The great Customs Line was 2,500 miles long and stretched from Torbela on the Indus to Mahanadi in the then Sambalpur district of Central Provinces (now in Orissa) and was guarded by an army of 13,000 officers and men at an annual cost of Rs. 16-17 lakhs. The line consisted of a huge barrier of an impenetrable hedge of bushes and undergrowth reinforced by stones and boulders and in some places even by masonry work. The Commissioner, Inland Customs Department, in his Administration Report for 1869-70 said, "The line divided into 110 beats, each presided over by a Patrol or an Assistant Patrol, is watched from 1,727 guardposts by some 10,000 men and non-Commissioned Officers. A very perfect system of patrolling exists and except in some very wild portions of the Central Provinces (where tigers bar the way alike to smuggler and

Customs Officers after dark) goes on with unabated vigilance night and day". The average quantities of the different kinds of salt which crossed the line were:—

	Maunds
Sambhar	5,60,759
Pachbadra	2,36,533
Didwana	3,09,181
Bharatpur	11,62,434
Salumbha (Nuh)	1,58,693
Sultanpur	6,80,233
Bombay	3,38,403
Madras	1,57,645
Saltpetre	25,872
Others	26,382
TOTAL	36,56,135

In 1869-70 60,58,101 maunds of salt and 20,61,067 maunds of sugar crossing the line were taxed and the gross realization amounted to Rs. 1,68,40,752. Remnants of old bungalows near the line are still found near Fatehpur and Ara. The essence of the salt revenue system prevailing up to 1870 in Northern India was the levy of duty on all salt imported into British India and suppression of manufacture of salt within it. Lord Lytton in 1873 attributed the existence of the line to the variations in rates of duty. Sir John Strachey in his budget speech in the Legislative Council on the 27th December 1877, also described its *raison d'être* in terms analogous to Lord Lytton's, viz; "in order to bring under taxation the salt imported from Rajputana into Northern India, and to shut out salt taxed at a lower rate".

II.—FROM 1870 TO 1947

India as a whole.—In 1870-71 the consumption of salt was about 2,30,00,000 maunds and the net revenue about £5,700,000. It was, however, recognised on all hands that the system of realizing revenue through the line was inherently unsound, cumbersome and a serious hindrance to traffic. The cost of collection was excessive (amounting to 13 per cent of the gross collections), the price of salt in the United Provinces was unduly high, while the line was obviously a serious hindrance to trade and a source of suppression. The administration of the line and the control of the salt works in Rajputana were, therefore, taken over from the Local Governments by the Governor-General-in-Council in the Finance Department. The great Sambhar lake in Rajputana was obtained on lease from the Jodhpur and Jaipur States with the object of increasing the supply of salt and reducing its price by skilled supervision at the source and improved communications between it and the markets. Duty was, however, still levied on the lake salt as it crossed the line and the establishment at the lake confined itself to the supervision of manufacture, the prevention of smuggling and the conduct of sales. An attempt was also made to revive manufacture in the interior; two groups of works being opened in the Jaunpur and Unao districts of the United Provinces. The attempt failed, as the cost of manufacture was so high and the salt so inferior to Bharatpur, Sambhar and Sultanpur salts that great difficulty was found in disposing it of. The Jaunpur salt in fact had to be destroyed. The eastern portion of the line was soon afterwards abolished, Berar and Central Provinces being permitted to obtain their salt from Bombay and Madras.

The lease of the Sambhar Lake having proved successful, it was decided to proceed with the removal of the Customs Line. Efforts were made to equalize duty throughout India. The duty in Bombay and Madras was accordingly raised to Rs. 1-13-0 from Rs. 1-8-0 in 1869. Treaties were negotiated with Indian States and the Customs line was ultimately abolished from Leiah on the Indus to Khandwa in Central Provinces with effect from 1st April 1879. The Finance Member in 1880 said:—

“The Inland Customs Line on the enormities of which I have so often dilated, finally disappeared at the commencement of the present official year. When I think of this abominable barrier which was likened to the great wall of China stretching 2,000 miles across the whole of India, so that if it had been put down in Europe, it would have reached from London to Constantinople, with the countless evils that it entailed, I find it difficult not to begin my old expressions of indignation. However, it is now dead and I congratulate your Excellency and the country on the fact. By its disappearance we have saved £1,00,000 a year”.

Amendment of the Law necessitated by the abolition of the Customs Line was effected by the enactment of the Indian Salt Act of 1882. The Inland Customs Department was replaced by the Northern India Salt Revenue Department. Retention of a portion of the line along the left bank of the Indus as far as the northern part of the Hazara district to prevent the entry of cheap Kohat salt into cis-Indus territory was, however, necessary. Duty on Kohat salt was low, Re. 0-3-0 up to 1883 and Re. 0-8-0 from 1883 to 1896. In 1897 it was raised to Rs. 2 and the last remnant of the Customs line was then abolished. The duty on Kohat and Punjab salt was equalised in 1905.

When the duty in Bombay and Madras was raised to Rs. 1-13-0 in 1869, it was reduced in Northern India from Rs. 3 to Rs. 2-12-0 and then to Rs. 2-8-0. In Bengal it was reduced from Rs. 3-4-0 to Rs. 3-2-0 and then to Rs. 2-14-0. A uniform rate of Rs. 2-8-0 was fixed thereafter throughout India. This was reduced to Rs. 2 in 1882 by Lord Ripon. It remained so till 1886 when it was again enhanced to Rs. 2-8-0. In Burma, however, the enhancement was from Re. 0-3-0 to Re. 1. From 1888 to 1903 the rates remained as above. In 1903 the duty was reduced to Rs. 2, in 1905 to Rs. 1-8-0 and in 1907 to Re. 1. There was abnormal rise in price of salt during the first World War and various measures were adopted to keep it down. Duty, however, was raised to Rs. 1-4-0 in 1917 to help in meeting the financial situation created by the War. It was raised to Rs. 2-8-0 in 1923, but again reduced to Rs. 1-4-0 in 1924.

From 1925 to 1931 the Assembly made attempts to reduce the duty to Re. 1, 0-12-0 or 0-8-0 but without success. Excise duties were enhanced by 25 per cent under the Indian Finance (Supplementary and Extending) Act, 1931, and the duty was raised to Rs. 1-9-0 which continued up to 1947, when duty on salt was abolished. Under the Salt (Additional Import Duty) Act of 1931, which came into force from 18th March 1931, an additional duty of Rs. 0-4-6 was levied on all imported salt, in order to give protection to the indigenous industry. The additional duty was reduced to Re. 0-2-6 from the beginning of 1933-34. The life of the Salt (Additional Import Duty) Act, 1931, as amended was extended up to 30th April 1936. In April 1936 a Bill extending by two years the operation of the Salt (Additional Import Duty) Act of 1931 subject to a reduction of the rate of additional import duty to one and a half annas was passed by the Legislative Assembly.

This protective duty, however, came to an end from 1938-39 when imported salt was also subject to the normal Excise duty only. From 1944, the levy, collection, etc. of salt duty were regulated under the Central Excise and Salt Act 1944. The duty, which was Rs. 1-9-0 per maund continued at this rate until it was abolished with effect from 1-4-1947.

III.—AFTER 1947

(i) *Abolition of Salt Duty.*—Mahatma Gandhi started the Civil Disobedience Movement in 1930. For this campaign he selected the Salt tax as the first item to be attacked. It was with a view to create a mass movement as Salt Law was an easily breakable law. Naturally, it caught the imagination of the public and the movement continued to gain momentum after it had been started by Mahatmaji by breaking the Salt Law at the Dandi Coast personally. Mahatmaji considered the Salt tax to be a symbol of India's servitude and he was of the strong view that salt should be free like air and water. As soon as the Congress came to power he insisted that the Salt Tax should be abolished. The salt duty was, therefore, abolished with effect from 1-4-1947. This step was taken on the eve of the Independence mainly because the Indian struggle for independence had a close relationship with the salt tax. The then Finance Member, the late Mr. Liaquat Ali Khan, in his Budget Speech for 1947-48, while referring to the Salt duty mentioned: "In regard to the salt tax, the objections are well known—the most valid being that it is laid upon a prime necessity of life and that it is repressive, the poor man paying as much as the rich man and perhaps, if he is a manual worker, even more". Mr. Liaquat Ali Khan also mentioned: "On the other hand, the incidence on the individual consumer is light, while the annual yield in revenue amounts to more than rupees nine crores. Until recent years, the yield from the tax formed a substantial part of the revenue budget and previous Governments have felt unable to dispense with so large an additional contribution. At the present time, however, the proportion which it bears to the total revenue is comparatively small so that this objection has considerably less force now than before. After careful consideration it has been decided that the tax should now be withdrawn".

Dr. Rajendra Prasad, the then President of the Constituent Assembly, at the time of discussions in connection with the framing of the Constitution of India in the Assembly in August 1949, mentioned. "It was not without reason that salt was selected by Mahatma Gandhi as the one tax out of so many taxes which the poor people of this country paid when he started his movement of disobedience. It was because he felt, and we all felt, that even the poorest beggar had to pay a share of this tax that he selected this particular tax and when he made his appeal (for civil disobedience) it caught throughout the country".

Immediately before the suspension of the salt duty, Dr. John Mathai was holding the portfolio of Finance Membership of the Government of India for a brief period. He published a note in the Press, especially on the question of salt duty, which appeared in the "Times of India", Bombay, in its 17th July, 1951 issue, extracts from which are given below:—

"It was during my brief tenure of the Finance Membership that the Government took the decision to abolish the salt tax. When the Congress assumed office, Mahatma Gandhi was staying in Delhi guiding and inspiring his followers in the duties of Government as he had guided and inspired them in the struggle for freedom."

"The salt tax was for him a crying symbol of India's servitude, a belief which he partly inherited from the Liberal leaders who directed the Congress in its early days. When the time came to fight British Imperialism by openly breaking its laws, he made the violation of the law imposing the salt tax the principal war cry for his followers.

"When freedom came it was natural, therefore, that he should fix upon the removal of the salt duty as the foremost responsibility of his followers in office. Almost the next day after my assumption of the Finance Membership, he sent for me and insisted that I should take immediate steps to abolish the tax."

(ii) *Imposition of Salt Cess*.—When the duty was abolished, the question as to how Rs. 75 lakhs, which were being spent on the Salt Organisation and were being charged to Revenue, should be met cropped up and was given consideration by the Government of India. It was felt that this was a legitimate charge on the Industry and accordingly under Section 37 of the Central Excise and Salt Act, 1944 the Government of India imposed a cess of Re. 0-2-0 a maund on salt manufactured by private factories and Re. 0-3-6 per maund on salt from Government factories, *vide* Finance Department (Central Board of Revenue) Notification No. 3, dated 29-3-1947. The higher charge for the Government salt sources was considered justified on the ground that the selling price of salt from these sources was much lower than that of salt from private factories, as the cost of production in the former was much lower than that in the latter.

Later, there was some doubt whether the cess had been legally imposed or not under this Section and the matter was regularised by an act of Parliament called "The Salt Cess Act, 1953", which became law with effect from the 2nd January, 1954.

(iii) *Indian Taxation Enquiry Commission*.—Government of India appointed a commission in 1953-54 known as "The Indian Taxation Enquiry Commission" to examine the present tax structure in India and make recommendations. The Commission went into the question of reimposition of duty on salt but did not favour its reimposition. The Committee observed:—

"Another tax which needs to be considered is the excise duty on salt. The salt tax had formed a part of the fiscal system of the country from ancient times and it had undergone considerable enhancement at the hands of the British Government in India. It had always been objected to by public workers in India beginning with Gopal Krishna Gokhale and ending with Mahatma Gandhi. During the later stages of this opposition, the salt duty acquired political significance as a symbol of foreign rule and its abolition became one of the main planks of the movement for independence. And with the advent of independence in 1947, the salt duty was abolished and has, since then, not been reimposed.

"An important factor to be considered in arriving at any decision about the desirability of reimposition of the salt tax is the present background of the extended field of commodity taxation. The Central excise duties cover commodities such as tobacco, cotton textiles, sugar, matches, tea, etc., which are consumed by the mass of the population. The sales taxes have been developed to include a wide coverage and their incidence is not very different from that of the salt tax.

"The proposals we have made elsewhere in the Report regarding extension of consumption taxes in the Central and States fields will still further increase the burden of consumption taxes. It will be seen, therefore,

that if the increase which has occurred and may occur hereafter, in the range and yield of consumption taxes is taken into account, a tax on salt superimposed on the consumption taxes cannot be justified merely on the ground that the incidence by itself is relatively light.

"There is an important factor which distinguishes the salt tax from similar taxes on comparable articles of general consumption such as food crops. Our examination of the general incidence of the tax system has shown that a large proportion of food crops is raised for domestic consumption and not for sale and, therefore, lies outside the reach of commodity taxes. Salt on the other hand even when manufactured in small concessional plots, is only to a limited extent used for personal consumption and is almost entirely sold for cash. Since salt is seldom produced on a subsistence basis unlike agricultural crops, it cannot escape payment of tax which makes the salt tax comparatively regressive in operation. A tax on salt is regressive also for the reason that its consumption, considered as an article of human food, is for the most part inelastic and hence its incidence falls heavily on the lower income groups. Moreover, since persons engaged in manual labour physiologically stand in need of a larger quantity of salt in their diet than others, the burden of the tax would be greater for such persons not merely in relation to income but absolutely.

"The political aspect of the question is not irrelevant to a discussion of the salt tax as a fiscal measure. Taxes are levied in order that revenue may be raised and the collection of revenue as an administrative problem presupposes a reasonable degree of responsiveness on the part of those who are required to pay it. A tax which may provoke widespread resentment and evoke popular resistance whatever its merits, must to that extent be regarded as an undesirable tax. From all that we have heard in the course of our enquiry this is a consideration which applies particularly to the salt tax and we think it would be a serious mistake of judgement to ignore it.

Considering the increase that has occurred, and may occur hereafter, in commodity taxation, a tax on salt cannot be justified merely on the ground that its incidence by itself is relatively light."

The Hon'ble Finance Minister (Shri C. D. Deshmukh) when questioned at a recent Press Conference made an interesting remark on the question of levy of salt duty. He said:—

"Salt Excise is a dead and salted issue. I see no fiscal reason why I should turn my eye to the Salt Tax again."

CHAPTER XXVIII

SALT AND THE STRUGGLE FOR FREEDOM

Salt is very intimately connected with our struggle for freedom. Salt has an economic importance as well, which is indicated by the almost universal prevalence in ancient and medieval times of salt taxes or of State monopolies of salt. For more than 2,000 years, the production of salt in India has been the monopoly of successive rulers. Monopolies everywhere were mainly directed to the procurement of revenue. This tax though small with *per capita* incidence negligible was felt by political thinkers as an inappropriate tax in that it made no distinction between the rich and the poor. So, Mahatma Gandhi in connection with the struggle against the British Imperialism selected 'Salt' for his campaign of Civil Disobedience started on March, 12, 1930, at Dandi in Bombay State. The Salt Tax for him was a crying symbol of India's servitude, a belief which he partly inherited from the liberal leaders who directed the Indian Congress in its early days.

A.—CIVIL DISOBEDIENCE MOVEMENT

On January 2, 1930, the Working Committee of the Indian National Congress at its first meeting passed a resolution fixing Sunday, January, 26, for a country-wide demonstration supporting the goal of 'Purna Swaraj' or Complete Independence. On the eve of this momentous day, Mahatma Gandhi wrote:

"India has been ruined economically. The revenue derived from our people is out of all proportion to our income. Our average income is seven pice, less than 2 pence per day and of the heavy taxes we pay, twenty per cent are raised from revenue derived from the peasantry and three per cent from the Salt tax, which falls most heavily on the poor".

Referring to the Congress Resolution on Independence, the Viceroy of India announced in the Central Assembly on January, 25, 1930:

"It remains my firm desire as it is of His Majesty's Government to do everything that is possible for conciliation in order that Great Britain and India may collaborate together in finding a solution of the present difficulties. But it is no less incumbent upon me to make it plain that I shall discharge to the full, the responsibility, resting upon myself and upon my Government for the effective maintenance of the authority of Law".

Mahatma Gandhi was prepared to put off Civil Disobedience, if Britain would grant the substance, if not the outward form of self-Government. He demanded eleven things, out of which "the abolition of the salt tax" was one.

In February, 1930, the Congress Working Committee met at Sabarmati and resolved that "Civil Disobedience should be initiated and controlled by those who believe in non-violence for the purpose of achieving *Purna Swaraj* as an article of faith. The great question that hung in the air now was: How? What shape the Civil Disobedience is going to take this time?" And then Mahatma Gandhi gave the hint. He said:—

"There is no article like salt, outside water, by taking which the State can reach even the starving millions, the sick, the maimed and utterly helpless. The Tax constitutes, therefore, the most inhuman poll tax, the

ingenuity of man can devise". So Gandhiji was contemplating some method of attacking this nefarious monopoly, and it was decided that Mahatma Gandhi would launch Civil Disobedience Movement. On March 2, 1930, he addressed a historic letter to Lord Irwin, the then Viceroy and Governor-General of India and sent through a young English friend, Reginald Roy-nolds, in which amongst various points, he mentioned about 'Salt' as follows:—

"But the British system seems to be designed to crush the very life out of him. Even the salt he must use to live is so taxed as to make the burden fall heaviest on him, if only because of the heartless impartiality of its incidence. The tax shows itself more burdensome on the poor man, when it is remembered that salt is the one thing he must eat more than the rich, both individually and collectively. But if you cannot see your way to deal with these evils and my letter makes no appeal to your heart, on the eleventh day of this month, I shall proceed with such co-workers of the *ashram* as I can take, to disregard the provisions of the Salt laws. I regard this tax to be the most inequitable of all from the poor man's stand point. As the independence movement is essentially for the poorest in the land the beginning will be made with this evil. The wonder is that we have submitted to the cruel monopoly so long. It is, I know, open to you to frustrate my design by arresting me. I hope that there will be tens of thousands ready, in a disciplined manner, to take up the work after me, and in the act of disobeying the Salt Act, to lay themselves open to the penalties of a law that should never have disfigured the statute book". The Viceroy's prompt reply was simply an expression of regret that Mahatma Gandhi should be "contemplating a course of action which is clearly bound to involve violation of the law, and danger to the public peace". Gandhiji exclaimed "on bended knees, I asked for bread and I have received stone instead". On March 12th, 1930, he wrote:

"It was open to the Viceroy to disarm me by freeing the poor man's salt, tax on which costs him five annas per year or nearly three days' income. I do not know outside India any one who pays to the State Rs. 3 per year, if he earns Rs. 360 during that period.

"But I know that salt tax has to go and many other things with it, if my letter means what it says. Time alone can show how much of it was meant.

"The reply says I contemplate a course of action which is clearly bound to involve violation of the law, and danger to the public peace. In spite of the forest of books containing rules and regulations, the only law that the nation knows is the will of the British Administrators, and the only public peace the nation knows is the peace of a public prison. India is one vast prison-house. I repudiate this law and regard it as my sacred duty to break the mournful monotony of the compulsory peace, that is choking the heart of the nation for want of free vent."

Arrangements for starting the Salt Campaign were made. The first batch of *satyagrahis* numbering seventy-nine hailed from the Punjab, Gujarat, Maharashtra, U. P., Kutch, Sind, Kerala, Rajputana, Andhra, Karnataka, Bombay, Tamil Nad, Bihar, Bengal, Utkal, Nepal and Fiji. The ages of the *satyagrahis* varied from sixteen to sixty-one, the eldest being Mahatma Gandhi.

On March 10, Gandhiji announced:—

* * * * *

"Then I would ask you to proceed a step further. Supposing ten men in each of the 700,000 villages in India come forward to manufacture salt and to disobey the Salt Act, what do you think can this Government do? Even the worst autocrat you can imagine would not dare to blow the regiments of peaceful civil resisters out of a cannon's mouth. If you will but bestir yourselves just a little, I assure you we should be able to tire this Government out in a very short time. I want you, therefore, to understand the meaning of this struggle and to do your part in it....".

Day after day, Mahatma Gandhi explained his programme, answered questions and gave his message at the prayer meetings. On the 11th March, in his evening prayer, he delivered a memorable speech on the eve of his historic march. He said:

"Wherever possible, civil disobedience of salt laws should be started. These laws can be violated in three ways. It is an offence to manufacture salt wherever there are facilities for doing so. The possession and sale of contraband salt, which includes natural salt or salt earth, is also an offence. The purchasers of such salt will be equally guilty. To carry away the natural salt deposits on the seashore is likewise violation of law. So is the hawking of such salt. In short, you may choose any one or all of these devices to break the salt monopoly".

On March 12, 1930, at 6-30 A.M. with the whole world watching on, Gandhiji started with seventy-eight followers on the historic March of Dandi. A huge crowd followed. Pandit Motilal Nehru said, "Like the historic march of Ramchandra to Lanka the march of Gandhiji will be Memorable". P. C. Ray remarked, "Like the exodus of Israelites under Moses". Pandit Jawaharlal Nehru observed, "To-day the pilgrim marches onwards on his long trek. And love of truth that scorches and love of freedom that inspires. And none that passes him can escape the spell, and men of common clay feel the spark of life. It is a long journey, for the goal is the independence of India and the ending of the exploitation of her millions".

On April 1, 1930, Gandhiji reached Surat and addressed 80,000 people on the banks of the Tapti. He exhorted them to participate in the struggle and break the salt monopoly of the Government as this would be a sure step towards Swaraj. In the course of his speech at Navsari, Gandhiji said: "Either I shall return with what I want or my dead body will float in the ocean". Gandhiji and his followers reached Dandi on April, 5. On April, 6, soon after the prayers, he with his followers proceeded for bath in the sea. At 8-30, he bent down and picked up a lump of natural salt. Thousands of people witnessed the solemn ceremony. No policeman was on the scene. Immediately after Gandhiji issued a statement, "Now that the technical or ceremonial breach of the Salt Law has been committed, it is now open to any one who would take this risk of prosecution under the Salt Law to manufacture salt, wherever he wishes and wherever it is convenient. My advice is that workers should everywhere manufacture salt, and where they know how to prepare clean salt, make use of it and instruct the villagers likewise, telling the villager at the same time, that he runs the risk of being prosecuted. Or, in other words, the villagers should be fully instructed as to the incidence of the Salt Tax, and the manner of breaking the laws and regulations connected with it so as to have the salt tax repealed. It should be made quite clear to the villagers that the breach is open and in no way stealthy. This condition being known, they may manufacture salt, or can help themselves to the salt manufactured by nature in creeks and pits near the seashore, use it for themselves and their cattle, and sell it to those

who will buy it, it being well understood that all such people are committing a breach of the Salt Law and running the risk of prosecution, or even without a prosecution, are to be subjected by the so called Salt Officers to harassment. This war against the Salt Tax should be continued during the National Week, up to 13th April....”

The campaign was started with right earnest all over the land. On April 14, Pandit Jawaharlal Nehru was arrested and that very day he was tried in prison and sentenced to six months imprisonment under the Salt Act. In anticipation of his arrest, he had nominated Gandhiji to act as the Congress President, but he having declined, Pandit Motilal Nehru became the acting President. After the arrest of Pandit Jawaharlal Nehru, the movement flourished with renewed vigour. There was firing in Calcutta, Madras, Karachi and *lathi* charges all over India. Processions and meetings were banned. The movement spread like wild fire over the land. Government repression was intense. Gandhiji wrote, “Even Dyerism pales into insignificance”. His own reaction was to make a more definite breach of the Salt Law at Dharasana. In his notice to the Viceroy, he stated: “If, therefore, you cannot see your way to remove the Salt Tax and remove the prohibition on private salt-making, I must reluctantly commence the march to Dharasana”. It was to be a gruelling battle, the climax of the campaign. But on May 4, 1930, Gandhiji was arrested in a strange manner at 12.45 A.M. while he was sleeping in his peaceful camp at Karadi, three miles from Dandi.

Gandhiji's arrest led to *hartals* and strikes all over India. Textile workers, Railway workers—all joined demonstrations in various parts of the country. There were mammoth processions impressive enough to induce the police to retire from the scene. In Poona, where Gandhiji was interned, resignations from honorary offices and from services were announced at frequent intervals. In Calcutta, police opened fire at the slightest provocation and arrested many people. There was firing also at Delhi. On the day of Gandhiji's arrest, Peshawar was surrounded by the Military and the Congress leaders were removed by the police. India rose like one man.

Raids in succession were also made in the salt depot at Wadala, a suburb of Bombay. George Solcombe, a British journalist who witnessed the raid on Wadala salt depot, obtained an interview with Gandhiji in jail on May 20. He wrote: “The imprisoned Mahatma, now incarnates the very soul of India”. Civil Disobedience continued in its full swing all over the country and thousands embarked prison bars.

B.—GANDHI-IRWIN PACT

On January 25, 1931, Lord Irwin, the then Viceroy of India issued a statement releasing Gandhiji and the members of the Congress Working Committee without any delay. January, 26, 1931, the first anniversary of Independence Day, was celebrated with great gusto. Release of Gandhiji and the members of the Congress Working Committee on that day added much to the enthusiasm of the people. On February 17, 1931, the Gandhi-Irwin talks commenced. Liberty to manufacture salt was one of the six demands made by him. On March 3, Gandhiji secured a concession on salt tax. On March 5, a truce was signed by Lord Irwin and Gandhiji at the Viceroy's House. Lord Irwin suggested that they should drink each others health in tea. Gandhiji agreed, but said that his own part of the toast should be with “water, lemon and pinch of salt only”. The Government

of India made the following announcement in their Home Department Notification No. S. 481-Political, dated the 5th March, 1931, and the relevant clause relating to salt is given below:—

The following statement by the Governor-General-in-Council is published for general information:—

“1. Consequent on the conversations that have taken place between His Excellency the Viceroy and Mr. Gandhi, it has been arranged that the civil disobedience movement be discontinued, and that, with the approval of His Majesty's Government, certain action be taken by the Government of India and Local Governments.

* * * * *

“20. Government are unable to condone breaches of the existing law, relating to the salt administration, nor are they able, in the present financial conditions of the country, to make substantial modifications in the Salt Acts.

“For the sake, however, of giving relief to certain people of the poorer classes, they are prepared to extend their administrative provisions on lines already prevailing in certain places, in order to permit local residents in villages, immediately adjoining areas where salt can be collected or made, to collect or make salt for domestic consumption or sale within such villages, but not for sale to, or trading with, individuals living outside them.

“21. In the event of Congress failing to give full effect to the obligations of this settlement, Government will take such action as may, in consequence become necessary for the protection of the public and individuals and the due observance of law and order.”

After the above notification, the Government of India, Finance Department (Central Revenues) issued the following Press Communique on 22nd May, 1931 regarding the extension of their administrative provision in connection with salt manufacture.

“DELHI PACT
GOVERNMENT OF INDIA
FINANCE DEPARTMENT (CENTRAL REVENUES)

Simla, the 22nd May, 1931

PRESS COMMUNIQUE

“Since the conclusion of the settlement between Lord Irwin and Mr. Gandhi the Government has been engaged in settling the details of arrangements and regulations in various districts to give effect to clause 20 of the settlement which related to the collection and manufacture of salt by local residents in villages immediately adjoining area where salt could be collected or made. These details in all cases are now practically completed and the general manner in which effect is to be given to the arrangement may be stated as follows:—

“(1) Clause 20 is intended to benefit the poor classes. It will be open therefore to those in villages adjoining salt areas to make or collect salt for domestic use and sale in their respective villages.

NOTE :—Domestic use shall include use for manure, cattle or fish-curing by individual fisherman.

- “(2) For this purpose the villagers may make salt pans or beds.
- “(3) There should be no sale of salt for purposes of trade outside the villages. It follows therefore that such salt can be carried only on foot and not in carts or such other conveyances.
- “(4) Wherever manufacture of salt under the foregoing clause is permitted salt pans will not be dirtied or otherwise interfered with by Government officers and regular watches will be withdrawn.
- “(5) The concession will be withdrawn from villages where it is found that it is abused. Wherever it is discovered that salt is manufactured or collected in quantities above the requirements of a particular village abuse of the concession will be presumed.”

C.—PROGRESS OF CIVIL DISOBEDIENCE MOVEMENT AND WORKING OF
GANDHI-IRWIN PACT IN DIFFERENT PROVINCES

(a) *Punjab and Uttar Pradesh*.—The representatives of the Congress had no experience of making salt. Their idea was to commit technical breaches of salt laws and to create a mass awakening by courting arrests. There was not much harm to salt revenue since illicit salt was not produced on a large scale. In the U. P., the agitation was most marked in Agra, Kanpur, Rai Bareli, Allahabad etc. The District Police officials were invested by Government with powers of salt revenue officers under the Indian Salt Act. The ‘Lunias’ and refiners as a class were not much affected by the agitation. The movement was at its height from April to June 1930 and gradually declined, as it took to other forms. The Delhi Agreement was signed in March, 1931 and came into force at once. According to this the poorer classes were allowed to manufacture salt or to collect it from outcrops or salt beds for domestic use. As a corollary, restrictions on less important substances like saltpetre, *khari* and *rassi* were also removed from September, 1931. Licenses for the manufacture of these substances were abolished, saltpetre refineries alone remaining under the supervision. The people in general did not avail themselves of the concession to any appreciable extent in the Provinces of Bihar, the United Provinces and the Punjab. Lunias, however, carried on the manufacture of salt under the Pact in some of the saline areas in the Jaunpur, Partabgarh, Sultanpur, Mathura, Agra and Kanpur districts of U. P. During 1933-34 to 1939-40 no serious breaches of the Salt Act were noticed.

(b) *Bengal and Bihar*.—In Bengal and Bihar also people near saline tract took advantage of the concession. Agitation had been intense in Saran District of Bihar. No systematic or organised abuse of the concession came to light, though a few miniature factories sprang up in the saline area in the Puri district. Isolated cases of attempts to violate the terms of concession, such as attempts to export contraband salt to the Feudatory States were promptly checked by confiscation of salt. In Bengal the concession was abused in Midnapur and Chittagong districts. In 1934-35, 75 cases involving 92 persons and during 1935-36, 196 cases involving 283 persons were reported. The cases reported from other districts were of similar nature. Salt on which duty had not been paid was stopped in transit. The salt was being transported for trade in clear violation of the Delhi Pact. Instructions were issued by Government to the Collectors of the saliferous districts of the Presidency to adopt stringent remedial measures to prevent the abuse of the concession. All these cases were in respect of illegal transport of locally made non-duty paid salt from the saliferous tracts to non-saliferous areas for the ostensible purpose of illicit trade in clear violation

of the Delhi Pact. There was a marked fall both in the number of cases and persons involved during 1936-37, when 109 cases were reported involving 151 persons. Remedial measures promulgated by the Government of India in their Notification No. 14-Salt, dated the 11th July, 1936, prohibiting the transport of non-duty paid salt in excess of one maund in weight from certain specified areas in saliferous districts proved an effective check on the wide-spread abuse of the salt concessions. There was a further decrease of the offences during 1937-38 when 49 cases involving 88 persons were reported. The restriction was found to be generally effective in suppressing the abuse of salt concessions.

(c) *Bombay*.—

“DANDI MARCH” CIVIL DISOBEDIENCE AND UNLICENSED
SALT MANUFACTURE

Under the Bombay Salt Act, 1890, the manufacture of salt without a formal license was forbidden in the Bombay Province. Mention has already been made of Mahatma Gandhi's Dandi March and starting of Civil Disobedience Movement by breaking the Salt Laws. The Government imposed a ban and arrested all Congress leaders. This was followed by a wave of *hartals* all over the country. No less than 60,000 political workers were placed behind prison bars. The Government of the day found the rising tide of opposition too difficult to be stemmed. After continued correspondence a settlement was reached between the then Viceroy Lord Irwin and Gandhiji, known as Gandhi-Irwin Delhi Pact of 1931, details of which have already been given. The following instructions were issued to the Salt Department Officers following the signing of the Pact:

- (1) Officers should not interfere with villagers making or collecting salt in areas immediately adjoining their villages for purely local consumption;
- (2) making of salt for sale within the villages is not to be construed as authorising establishment organised factories. It would, however, be reasonable or even practicable to insist that salt made or collected under these arrangements, should be for household use only of the persons making or collecting;
- (3) it should be considered an abuse of the concession, if salt were removed in bulk from the villages for sale, in the neighbouring markets or bazars the test of abuse will lie in salt being removed in carts or other means of transport other than on foot from the neighbourhood.

The underlying spirit of the concession was to benefit the poorer classes and not persons carrying on organised manufacture of or regular trade in salt. This was further clarified by the Government as under:—

- (a) to a limited extent the concession extended to making or collecting salt for sale and trade in salt;
- (b) no definite distance between villages and salt sources was laid down with a view to distinguish areas “immediately adjoining” from other areas the test being that villagers should neither come to the salt sources nor take their salt way, otherwise than on foot.

There was a temporary truce on account of this settlement. The movement, however, was restarted in January, 1932, when attempts were made to import salt from Goa. A mass attempt to rid the Sanikatta Salt Works was made in 1932. Large areas of the talukas of North Kanara District were the scene of manufacturing operations. From 1934 to 1940 attempts

were made at different places such as Ratnagiri, Kanara (near the Shiroda and Sannikatta Salt Works), Thana and Kolaba districts by private persons to manufacture salt by opening hundreds of salt pans. Where there was widespread abuse, the concession of private manufacture was withdrawn, such as from Vengurla Mahal of Ratnagiri district.

(d) *Madras Presidency*.—The Civil Disobedience movement was started about the beginning of 1930-31 and continued for some months. A great quantity of spontaneous salt is formed in Madras and so officers of the Madras Salt Department had a trying time. They destroyed spontaneous salt in swamps and coastal areas and had to combat the activities of salt civil resisters in general. In most of the districts, the Salt Revenue Officers who were placed under District Magistrates co-operated with the Police Department to put down the movement. Most of the cases were those of removal and possession of swamp-salt by "satyagrahis" or civil resisters; there were only a few cases of manufacture and possession of contraband salt and salt earth. The activities of civil resisters were most pronounced in the Ganjam, Naupada, Pennugudru, Chinnaganjam, Cheyur and Tranquebar circles and in the west coast preventive area in localities like Calicut and Mangalore. The organised attempts to break salt laws reached their height about the middle of May when attempts were made to raid salt factories or depots. These attempts were frustrated. They were followed by attempts to manufacture salt from sea water or salt earth especially in the Nellore, Chingleput, Tanjore and Ramnad districts. The process of extracting salt by boiling was found expensive and troublesome and was given up. After five or six months, the movement so far as it was directed against salt laws, subsided. It had very little effect on the salt revenue as it was more in the nature of a demonstration than of any serious attempt to manufacture salt on a large scale.

The concession in Madras was granted under the Delhi Pact as elsewhere. The concession was, however, grossly abused in the Nellore, Tanjore, and Ramnad districts and was, therefore, withdrawn in October 1931 from the Gudur and Sulpur Taluks in Nellore district and from Ramnad Madukulattur Taluks in Ramnad district. During 1932-33 the concession had to be withdrawn from the Cuddapah district, and some Taluks of the Anantpur, Kurnool and Tanjore districts owing to widespread abuse. During 1933-34 it had to be withdrawn from the remaining Taluks in the Kurnool and Kanuparti districts and from some of the Taluks in the Bellary and Chingleput district. In the ceded districts, especially the Kurnool and Cuddapah districts, the manufacture of contraband salt under the 'Muda' system was resorted to on an extensive scale in spite of the withdrawal of the concession from this area. In the Vattanam Circle numerous cases of collection and removal of spontaneous salt from swamps occurred in areas from which the concession had been withdrawn. The number of offences during 1934-35 was 1,102 against 843 in 1933-34. The offences against salt laws were being committed by the manufacturers without any regard to the Gandhi-Irwin Pact. During 1935-36, 1,144 offences were committed mainly in the Tada and Vattanam Circles due to heavy formations of spontaneous salt in the swamp areas as in the previous year. The quantity involved was 1,400 maunds. During 1936-37, 792 cases of offences against the salt laws were reported involving 924 maunds. 686 cases of offences against the salt laws were reported in 1937-38 which involved 1,635 maunds of salt. There was a remarkable increase in the number of cases during 1938-39 when 1,420 cases against the salt laws were reported. The increase was due mostly to breaches of the Delhi Pact concessions in the Kanuparti,

Tada, Adirampatnam, Vattanam and Tuticorin Circles where the salt from the swamps and privately laid out factories was removed in large quantities by persons from distant places on headloads, carts and other conveyances in flagrant violation of the conditions governing the concessions. Offenders were traced in 1,354 cases only. The total quantity of contraband salt involved was 11,199 maunds. There was a further increase in the number of cases during 1939-40 when 1,812 cases were reported.

D.—WITHDRAWAL OF THE CONCESSION GRANTED UNDER THE DELHI PACT

When the then Government thought that the concession granted under the Gandhi-Irwin Pact was being widely abused by the villagers and others, the Central Board of Revenue issued a Circular to all 'Heads of the Salt Departments' in their Order No. 624-Salt/34, dated 5-3-1937, which mentioned:—

“When Heads of Salt Departments consider that particular circumstances make it desirable to withdraw the concession in any particular area, they will report directly to the Central Board of Revenue, who, if they agree, will ask the Government of India to consult the Provincial Government concerned before passing final orders. When final orders have been passed by the Government of India, the officers of the Salt Department will be instructed to give the necessary publicity to the decision. At the same time, the Provincial Government will be informed of the decision and asked to take suitable measures for making it known to the inhabitants of the neighbourhood affected.”

E.—RELAXATION OF THE GANDHI-IRWIN PACT

The concession of unlicensed manufacture of salt under the Gandhi-Irwin Pact of 1931 continued till 1948. India attained freedom on 15-8-1947 and a few months earlier, the excise duty on salt had been abolished by the pre-independence Interim Government with effect from 1-4-1947. Due to various adverse circumstances, there were salt shortages at many places in the country. The Government of India set up an Inter-Departmental Committee in 1947 under the Chairmanship of Shri H. M. Patel, I.C.S., the then Cabinet Secretary, to report on the measures necessary to overcome these shortages and to recommend steps for successive higher production and better method of distribution in order to eliminate, as far as possible, the periodic complaints of shortage. Amongst various recommendations made by this Committee, the measures to be taken to step up the production was one. As a first step to implement this recommendation, the Government of India issued a Press Note on 23-4-1948 relaxing the Gandhi-Irwin Pact. The Press Note was as follows:—

F.—POLICY TO STEP UP SALT PRODUCTION

Small Scale Manufacture not Subject to Licensing

“The Government of India are formulating comprehensive measures to step up indigenous production of salt so that India attains complete self-sufficiency in this vital commodity in as short a time as possible. Details of the Government plan including a licensing system for large scale manufacturers and measures to encourage production by co-operative societies will be released to the Press shortly.

"Meanwhile Government consider that the first instalment of the plan should be made public immediately so that small scale manufacturers may take full advantage of the current salt season.

"Henceforth individuals or groups may freely produce salt in any land to which they have lawful access for this purpose and by whatever process they desire, i.e. construction of pans and solar evaporation or boiling of brine or scraping or excavation of saline earth or natural formations of salt provided that the total area of land covered by the salt works set up by any individual or group is not more than 10 acres. No licences are needed and no applications for licence need be sent to any Government authority in such cases. The provision of the Central Excise and Salt Act, 1944, will not stand in the way of the right of the small scale manufacture mentioned above.

"It will be appreciated that Government's new policy is greatly in advance of the concession which was given as a result of the Gandhi-Irwin Pact in 1931 to villagers. At that time the Government of India merely permitted manufacture and collection of salt by local residents in villages immediately adjoining areas where salt could be collected or made. Even this small concession was hedged in with restrictions. The salt produced could not be sold for purposes of trade outside the villages nor could it be carried except on foot. Under Government's new policy salt produced in units covering not more than 10 acres will not be subject to any restrictions by way of storage, transport and sale.

"As, however, salt has an intimate bearing on human health, Government attach considerable importance to the quality of the salt produced by small scale manufacturers without licence. While the high quality of salt produced by large-scale factories will automatically set a standard inviting emulation by small scale manufacturers, Government reserve the right to take suitable preventive measures against the sale of unwholesome salt for human consumption."

As a result of the above relaxation, many maritime and inland unlicensed salt works were started throughout the coastal area and in the Rann of Kutch. As these salt works are not subject to licensing under the provisions of the Central Excise and Salt Act, 1944, the salt produced in them has been exempt from the levy of cess at Re. 0-2-0 per maund. They are also free, in practice, from the quality control which is enforced in the case of salt produced in all licensed factories. The result has been that the salt production by the unlicensed manufacturers has shown a rapid increase in production; i.e. whereas the production by unlicensed manufacturers in 1949 was only 3 lakh maunds, it rose to 13 lakh maunds in 1950, 25 in 1951, 40 in 1952, 52 in 1953, 55 in 1954 and to 37 lakh maunds in 1955.

The chief object of extending the concession to the owner of small salt works was to meet the local requirements and to fill up the large gap which existed in 1948 between the supply and demand in the country as a whole. The position has since altered materially; supply has exceeded the demand of the country by considerable margin and large exports are being allowed to foreign countries, like Japan, East Africa, etc.

There have been many complaints that the concession allowed to small-scale unlicensed manufacturers is being abused on a large scale and has given rise to haphazard growth of salt production affecting the production in the organised licensed factories. The production of the small scale producers, which is now far in excess of the local requirement, is increasing

day by day, and salt is being transported to distant markets to compete with the production of licensed factories. In fact, the misuse of the concession, whereby traders buy salt at lower prices from the small scale manufacturers who are not subjected to any quality control and do not pay cess, has forced some of the organised licensed factories into a very disadvantageous position, and even driven some out of the business. The organised factories lodged strong protests stating that the ten-acre concession was being grossly abused. Government, therefore, decided to undertake a survey of all the places where individuals or groups of individuals were manufacturing salt under the ten-acre concession with a view to assessing, amongst others, the exact extent to which the concession was being abused. This survey was completed and the views of interests concerned were considered carefully. It was provisionally decided that the concession should be reduced to $2\frac{1}{2}$ acres. The matter, however, was given further consideration and the Government of India decided that as a matter of general policy, it would not be right to reduce the area since most of the ten-acre concessionaires were like cottage industry workers. Government, however, did feel that the small licensed manufacturers were certainly handicapped and, therefore, decided that the licensed manufacturers with holdings up to 10 acres should also be given the concession of the exemption from cess. Government also extended this concession to Co-operative societies with a view to foster co-operative movement amongst the salt manufacturers. They therefore, issued the following Press Note on May 11, 1955:—

“POLICY REGARDING SMALL-SCALE MANUFACTURE OF SALT

Under the Press Note dated 23rd April, 1948, the Government of India permitted individuals or groups to produce salt freely in any land to which they have lawful access provided the total area of the land covered by the salt works did not exceed ten acres. Following this and other measures adopted, salt production in the country was successfully stepped up in rapid strides so that India became self-sufficient in salt and was also able to export a substantial surplus.

“The policy was reviewed in 1953-54 when special consideration was given to the anomaly that had thus come into being that all the originally licensed producers, including those in holdings of one to ten acres or even smaller areas, were subject to payment of salt cess and were later brought under quality control, but the persons benefiting by the 1948 concession were not paying any salt cess.

“Having regard to the above, the Government of India announced in a Press Note dated the 2nd March, 1954 that after reviewing the concessions regarding the small-scale manufacture of salt granted under the Press Note of 1948 they had come to the conclusion that in the present conditions the concessions should be modified so that the following limitation was observed after 1st March, 1955, namely, that individuals or groups may freely produce salt in any land to which they have lawful access for this purpose provided that the total area of the land covered by the salt works did not exceed $2\frac{1}{2}$ acres.

“2. Since the above announcement of 1954, the view has been pressed on the Government of India that the modification of the 1948 concession by limiting the free production of salt to areas of $2\frac{1}{2}$ acres or less was likely to result in discouraging producers who had established themselves after 1948 with considerable effort. As for the ground that had been urged that the small producer was not very often deriving the benefit from

the exemption from cess on small-scale production, where he was being exploited by money-lenders or financiers, it was represented that separate remedies would have to be found. On the other hand, representations made to the Government established the fact that small-scale licensed manufacturers had to face unequal competition with the unlicensed manufacturer as the latter was exempt from the payment of cess and was not subject to quality control and that this disparity was not justified.

"3. The Government of India have considered the view-points put forward by both the licensed and unlicensed small-scale manufacturers and have now decided that no cess should be collected on manufacture of salt in areas up to 10 acres. This would give equal opportunities for both the licensed and unlicensed manufacturers working in areas up to 10 acres and the concessions allowed in 1948 would also therefore remain unaffected. The following concessions are, therefore, announced regarding small-scale manufacture of salt which will come into force from the 15th May, 1955:—

- (1) Individuals or groups of individuals, whether they come under the licensing system or not at present, may freely produce salt in any land to which they have lawful access for this purpose and by whatever process they desire, that is, construction of pans and solar evaporation or boiling of brine or scraping or excavation of saline earth or natural formations of salt, provided that the total area covered by the salt works so set up does not exceed 10 acres. No licence will be required for this purpose and no application need be made to any Government authority.
- (2) All manufacturers of salt in areas up to 10 acres under the concession mentioned in (1) above will be exempt from the levy of the cess, including those now under the licensing system.

"4. Since the quality of salt has a direct bearing on human health, Government reserve the right in respect of the salt produced by manufacturers working in areas less than 10 acres as in the case of all other salt production to take suitable preventive measures against the sale of unwholesome salt for human consumption."

The above concession was also extended to those small-scale manufacturers (whose individual holdings do not exceed ten acres) who are organised as members of co-operative societies even if the total area under salt production with each of such societies exceeded 10 acres.

In order to encourage co-operative effort in the country and to meet the demand from the small-scale licensed manufacturers, the position was further examined and the Government decided to reduce the recovery of cess from two annas to one anna per maund on salt manufactured in areas exceeded ten acres but not exceeding hundred acres. This decision is also applicable to members of the co-operative societies.

CHAPTER XXIX

LABOUR IN SALT INDUSTRY

The Salt Department was purely a Revenue Department so long as there was duty on salt. The salt duty was abolished with effect from 1-4-1947. Thereafter its transformation into a Development Department began. The country was then suffering from shortage of salt and was partially dependent on foreign salt. The Salt Department had, therefore, to concentrate its efforts on making the country self-sufficient in the matter of salt supply. The objective was achieved in the year 1951. Since then the attention has been focussed on improving the quality of salt. At present this is one of the main functions of the Department. It was, however, noticed that little importance was being attached to the welfare of the salt labour. It was considered that steps in this direction should be taken, side by side with the steps for improvement of the quality of salt. Satisfactory progress had already been made but many welfare measures have yet to be introduced to better the lot of the salt labour.

The Salt Industry is concentrated in the States of Himachal Pradesh, Rajasthan, Bombay, Saurashtra, Kutch, Madras, Travancore-Cochin, Orissa, Andhra and West Bengal. There are Government Salt Mines at Mandi (Himachal Pradesh) and Government Salt Works at Sambhar Lake, Pachbadra and Didwana (Rajasthan) and at Kharaghoda and Sulemanshah (Bombay). In the Himachal Pradesh and Rajasthan, there are no salt sources other than those owned by Government. In the Bombay State, there are private-owned salt works also. In the remaining States viz. Kutch, Saurashtra, Madras, Travancore-Cochin, Andhra, Orissa and West Bengal, the industry is solely in private hands. The efforts of the West Bengal Government to establish salt industry on Contai-sea-board (Midnapore District) have not borne any fruit so far.

The Government of India are directly responsible for the welfare of labour employed at the Government Salt Sources, viz. Mandi, Sambhar Lake, Pachbadra, Didwana, Kharaghoda and Sulemanshah, etc. The Government sector produces about 22% of the total production, i.e. 167 lakh maunds of salt and the private-owned sources including unlicensed manufacturers about 78% i.e. 606 lakh maunds of salt every year (average on the basis of last four years). It will be seen that judging from the large number of salt works owned by the private persons, their locations at various places in several States and their share of the total output of salt in the country, larger responsibility rests on the private sector of the Salt Industry in the matter of providing amenities to the labour employed in the Industry.

A.—GOVERNMENT SECTOR.

The number of labourers engaged per day on an average at the Government Salt Sources during 1953 is given below:—

R.S.S.Division	about 2,860	Salt sources at Sambhar Lake, Pachbadra and Didwana. During the brisk manufacturing season i.e., April and May, 1953, the total number of labourers employed daily was about 10,000 to 11,000.
Bombay	about 800	Salt sources at Kharaghoda and Sulemanshah.
Himachal Pradesh	about 110	Salt Mines at Drang, Guma and pan works at Maigal in Mandi Salt Circle.
Total		3,770

(a) R.S.S. Division.—The labour consists of about 300 regular workers, i.e. those employed by Government from year to year. There are about 100 seasonal workers, i.e. those employed during the season of salt production, about 100 casual workers, i.e. those engaged on execution of works by Department and about 2,400 workers employed through contractors.

The regular and seasonal workers are employed generally in the workshop, power house and at pumps etc. in Kyars. The casual workers are employed for the departmental execution of certain works. Workers employed through contractors are for (i) extraction and storage of salt, (ii) bagging, sewing and despatch of salt and (iii) the execution of other works not undertaken departmentally. The first two contracts are generally held by a Co-operative Society, viz. the R.S.S. Co-operative Labour and Savings Society, year after year.

Housing Accommodation.—Housing accommodation for about 200 workers is available. As a large number of the persons employed at the sources are local residents, they live in their own houses in the town. For the contractor's labour employed on the extraction and storage of salt, temporary *kutchra* pannigrass huts are provided every year. The R. S. S. Co-operative Labour and Savings Society intend to construct *pucca* houses for labour and has applied for the grant of subsidy under the Government's Subsidized Housing Scheme for Industrial Workers.

Supply of wholesome drinking water and washing facilities.—In the power house and workshop, pipes have been laid for the supply of potable water. In the kyars and at the Central Stores, 8 water cisterns have recently been constructed and about 15 more have been proposed for construction during the next 3 years. An electric water cooler has been installed in the workshop. A hydrant in the premises of the R.S.S. Co-operative Society for use of the labourers is also being installed.

Shelters.—To protect the labour from the sun and the rain, 6 shelters each costing Rs. 2,000 at various places at the Lake have recently been constructed. 17 more shelters are proposed to be constructed in the next three years. 7 shelters for pointsmen etc. have also been built and 19 more shelters for them will be constructed during the next 3 years.

Electric Lighting facilities.—6 light points have been provided in the labour colony. 20 more points are proposed to be provided during the next 2 years.

A Radio set has been installed in the Labour colony by the R.S.S. Co-operative Society. Electricity is supplied free of charge by the Government.

Sanitation Facilities.—Lavatories and urinals have been constructed at various places. During the malarious season, necessary measures for spraying of DDT etc. are taken to prevent occurrence of disease. Timely vaccination and inoculation are also done to safeguard against small-pox and cholera.

Medical facilities.—The labourers are treated free at the Departmental, Hospitals at Sambhar Lake and Pachbadra. At the Sambhar Lake Hospital facilities for X-Ray and screening are also available. At Didwana and Nawa, local doctors under the Rajasthan Government are paid an allowance for

attending the employees and labourers of the Department. It is proposed to establish a Dispensary at Didwana. Besides, for emergencies, first aid boxes are kept in every Circle, under the charge of Inspectors who have been trained to give first aid.

Application of Labour welfare statutes.

Factories Act, 1948.—The Chief Inspector of Factories, Rajasthan, visited Sambhar Lake in the beginning of 1954 to decide whether the Factories Act applies to Workshop, Power House and Salt manufacturing units and Central Stores. He decided that the Workshop and Power House alone should be registered as a Factory and the Manufacturing units did not come within the purview of the said Act. The Salt Department has, however, taken steps to see that the practices and procedures at the Rajasthan Sources conform to the requirements of the Factories Act. For instance, it is proposed that the grant of leave which is at present regulated under executive orders, should be regulated under the Factories Act. Overtime allowance is already being paid as provided under the Factories Act and so are hours of work and weekly rest day. Compensation is paid under the Workmen's Compensation Act.

No minimum wages for labourers engaged in Salt Industry seem to have been fixed by the State Government. The monthly-paid workers are given prescribed scales of pay. In the case of daily-rated labourers, they are paid at rates approved by the Central Public Works Department for their labourers. A Fair Wages Clause is inserted in all the contracts, so as to ensure that the labour employed through contractors are paid fair wages. Standing Orders are being provided under the Industrial Establishments (Standing Orders) Act, even though definite rules exist in regard to appointments, punishment, removal etc. of workers.

(b) *Pachbadra and Didwanas.*—At Pachbadra and Didwana, the manufacturers, known as Kharwals and Deswals respectively, are a sort of petty contractors. Kharwals at Pachbadra are granted advances to deepen and renovate their pits and salt is purchased from Kharwals and Deswals at a fixed price. The Department has arranged for the supply of drinking water and other welfare measures are also under consideration places.

(c) *Kharaghoda Salt Works.*—The number of workers is about 800.

Housing Accommodation.—Government gives plots of land on lease for constructing quarters and for agricultural purposes of the Agarias at nominal rents, in the village owned by the Salt Department.

Supply of drinking water and washing facilities.—Drinking water is supplied free to Agarias and their families. Work on a scheme to improve the water supply arrangement at a cost of about Rs. 1,00,000 is in progress.

Electric lighting facilities.—There is a proposal for electrification of Kharaghoda Salt Works at a cost of about Rs. 1,50,000.

Sanitation facilities.—Conservancy staff is employed by the Department for sanitation purposes and effective measures are taken to create hygienic conditions.

Medical facilities.—The Department runs a hospital at Kharaghoda to meet the needs of the Agarias. There are in-door wards for treating patients in the hospital itself. There is a maternity ward as well. The Nurse at the Hospital also goes to the Agarias' houses for attending labour cases. The Medical Officer visits the Works periodically.

School.—There are four schools run by the Department at Kharaghoda where children of the Agarias are being taught up to 7th standard. Education upto primary standard is free. Three schools are run in the Salt Works themselves for the benefit of the children of the Agarias when they are employed on salt manufacture.

A Co-operative Society of Agarias under the supervision of the Department is being run for the supply of essential commodities to the Agarias.

Application of Factories Act, 1948.—The Salt Works at Kharaghoda have been registered under the Act from 1953 and the Salt Department has taken steps to follow the requirements of the Act.

The position of Agarias at Kharaghoda is different from the labourers employed at Sambhar Lake but is similar to that of Deswals at Didwana and Kharwals of Pachbadra. The Agarias, Deswals and Kharwals are paid for the salt produced and delivered by them to the Department.

Sulemanshah Salt Works.—Construction of 20 quarters for the Departmental labour in the works at an estimated cost Rs. 20,000 has been completed.

(d) *Mandi Salt Mines.*—The Indian Mines Act, 1952, applies to the mines. In accordance with the provisions of the Act leave with wages and weekly days of rest are given. Pucca tunnels, drains, etc. are being built to provide safe working conditions in the mines. Air Compressors and Ventilators are being installed to provide good air current underground. These mines were taken over by the Government of India on 1-4-1950 and since then several welfare measures have been pushed through; such as provision of water supply, rest shelters, construction of urinals and latrines and a dispensary. Further measures are under consideration.

Fair wages prescribed by the C. P.W. D. are kept in view. At the time of taking over by the Government of India salt sources of Mandi from 1-4-1950 the daily wages of miners were Rs. 1-8-0 a day. These have gradually been increased upto Rs. 1-11-0 for miners, Rs. 1-13-0 for shotfirers and Rs. 2-1-0 for mates. It is proposed to grant regular annual increments to deserving miners till the maximum of the wage rate is reached.

Female labourers are given the maternity benefits under the relevant Act.

It is proposed to institute a Fund for the benefit of the old, decrepit miners and their dependents. It will be financed by contributions from the miners and grant-in-aid from the Government.

B.—PRIVATE SECTOR

The average number of labourers engaged daily in private salt sources is indicated below:—

Bombay	6,000
Saurashtra and Kutch	6,000
Madras and Andhra	14,000
Travancore-Cochin	800
Orissa	900
West Bengal	200

The responsibility to enforce the Labour Welfare Legislation in the private salt works rests with the State Governments. They have so far taken very little interest in the matter. The industry is mostly confined to coastal areas and except in Saurashtra and Kutch, it is generally in the hands of petty manufacturers who take to salt manufacture as a subsidiary occupation. In the big factories in Saurashtra and Kutch States and some other big one-licensee factories in other States the labour comes from neighbouring villages. They generally belong to agricultural classes. As the industry is seasonal and the labour is generally local, the manufacturers have not cared much for the provision of labour welfare in salt factories. Only recently, some steps have been taken.

In Saurashtra and Kutch only in some big marine salt works amenities like the provision of creches, grain-shops, canteens, schools etc. are available. The standard of general amenities in inland salt works is very low. The Saurashtra Government appointed a Labour Committee in 1952 known as "The Saurashtra Salt Works Labour Enquiry Committee". This Committee submitted an exhaustive report in 1955 and some of the main recommendations made by this Committee are summarised below. They recommended:—

- (1) Enactment of a separate labour legislation by the State Government for the Salt labour.
- (2) Recruitment and employment of labour direct by the industry instead of through the intermediaries like Mukaddams.
- (3) The labour should be stabilised in the industry instead of being tossed between their villages and the industry.
- (4) No child under the age of 14 should be employed in salt works and hours of work should be fixed for women workers, none should be employed between 8-00 p.m. and 6-00 a.m.
- (5) Measures to improve the working and living conditions, provision of leave with or without wages, adoption of an enlightened policy of the management, adequate wages, protection from sickness, etc. should be adopted to prevent absenteeism.
- (6) Certain festival holidays should be allowed with wages and leave with wages should also be given.
- (7) The Industrial Employment (Standing Orders) Act should be applied to the Inland salt industry and Government should set out model standing orders for the inland salt industry and the present system of making agreements should be scrapped.

- (8) Salt labour should be put at par with labour in other factories as regards working hours, spreading over, rest days and rest intervals—the spread overs and rest intervals should in fact be longer.
- (9) Canvas shoes up to above the ankle with rubber soles should be supplied to the workers working in the salt pans and salt heaps.
- (10) Over-time should be paid at double the normal rates and extension of work beyond 12 mid-night should be prohibited.
- (11) Employers should make adequate arrangements for drinking water near the residential places of the workers as well as in the pans.
- (12) Adequate latrine and urinal accommodation should be provided for the use of the labour.
- (13) Rest shelters, adequate washing and bathing facilities should also be provided.
- (14) As the labour is sweating labour, the Minimum Wages Act, 1948, should be applied to it.
- (15) Workers employed on picking, washing, heaping, loading, etc. should be paid on the basis of weighments and not on tipping wagons.
- (16) All workers, whether employed by the management or through the contractors, should be paid directly by the management and pay-rolls showing all details of payment should be maintained.
- (17) Wage period of a week in case of casual labour and a fortnight in respect of labour in Marine salt industry should be adopted and the Payment of Wages Act, 1936, should be extended to Marine Salt Works.
- (18) Pan-holders should be given monthly advances but these should bear no interest.
- (19) Better housing accommodation with sanitation facilities should be provided, and the labour quarters should be built on high level sites to save from annual inundation.
- (20) Employers should assume all responsibility for housing salt labour, and the labour should be encouraged to build their own houses on co-operative principle. There should be two types of houses: one-room and two-room tenements. The former should comprise one living room, kitchen, a verandah, a latrine and a bathing place and the latter should have an additional living room.
- (21) For the inland salt industry provision of accommodation for bullock and their fodder should be made.
- (22) The employers should provide educational facilities at least up to primary standard for the children of the workers and the school should be located within a reasonable distance of the residential place.
- (23) Each salt works should have a well-equipped dispensary and the employers should be statutorily asked to make provision for medical facilities.
- (24) The employers should also provide recreational facilities.
- (25) The workers should be encouraged to start co-operative consumers' stores and so long as these are not established, the manage-

ment should run the provision stores on "no profit and no loss basis".

- (26) Women should be given maternity benefits as in other industries.
- (27) All efforts should be made to develop a healthy trade union movement amongst the salt workers.

The Saurashtra Government under the Minimum Wages Act, 1948, appointed another Committee and Advisory Board in April, 1954 to enquire and advise Government on the minimum wages to be fixed for the labour engaged in the Salt Industry. As a result of the recommendations made by this Committee and the Advisory Board, the Saurashtra Government have fixed the following rates of wages with effect from 1-5-1955:—

Category of Workers	Daily rate inclusive of Dearness Allowance	Monthly rate inclusive of Dearness Allowance
	Rs. as. p.	Rs. a. p.
Skilled Workers	3 0 0	78 0 0
Semi-skilled Workers	2 8 0	65 0 0
Unskilled Workers	2 0 0	52 0 0

The Bombay Government have fixed the minimum wages under the Minimum Wages Act, 1948, in respect of employment of labour in Salt Pan Industry, after a Committee appointed in October, 1950 to enquire into and advise Government, in the matter of fixation of minimum rates of wages in respect of employment in the Salt Pan Industry, had submitted its report. The orders came into force with effect from 1-10-1953. The State has been divided into three zones for the purpose and the following rates of wages have been fixed:—

Class of Employees	Rates					
	Zone I		Zone II		Zone III	
	Rs.	As. Ps.	Rs.	As. Ps.	Rs.	As. Ps.
Salt Manufacture per month	65	0 0	46	0 0	56	0 0
Mud Workers per day	2	6 0	2	6 0	2	6 0

The Bombay Government also recently referred a dispute that had arisen between the salt-pan owners and the workmen at Uran, for adjudication to a Tribunal under the Industrial Disputes Act, 1947. The Government of Madras and Travancore-Cochin, who have declared salt industry as Public Utility Industry, have also referred for adjudication certain disputes between pan-owners and workmen, from time to time.

The Chief Inspector of Factories, Bombay, has only this year agreed with the Salt Department that salt factories come within the purview of the Factories Act, 1948. The question of applicability of the Act to all salt factories is under correspondence with the Chief Adviser of Factories, Government of India.

In the private-owned salt works in Bombay State, no amenities are generally provided in the salt works. However, in salt works where labourers, other than those belonging to neighbouring villages, are engaged thatched hutments are provided for them. They are also provided with water supply, rations etc. The amount spent on these amenities is deducted at the end of the season from the wages due to workers. In some salt works, improvised rest rooms are also provided.

In the salt works in Madras, Andhra and Travancore-Cochin no amenities for labourers have so far been provided. This is also the case in respect of factories in Orissa. Provision of amenities, such as rest shelters for labour, drinking water facilities and first-aid service is under consideration.

In so far as the Salt Department is concerned, the salt labourers in the private sector are being encouraged to form co-operative societies so that they may be able to undertake salt manufacture or take up works for execution on contract.

C.—TRADE UNIONS AND LABOUR DISPUTES

The labour in the Salt Industry is seasonal and unorganised as generally the salt manufacture is a second occupation to them subsidiary to agriculture. There are very few unions. The following unions, however, exist in the Government Salt Sources:—

1. The Rajasthan Salt Workers' Union, Sambhar Lake.
2. The Rock Salt Mines Labour Union, Mandi.

Besides these, there are some labour unions in the private salt works, e.g. the Bombay State Mithagar Kamgar Federation, Salt Workers and Labour Union, Humma (Ganjam).

Generally the industry has been free from disputes and strikes. During the last 5 years only one or two small strikes have taken place and settled peacefully. The disputes in each State come under the State sphere and whenever disputes occur, the local Labour Commissioner is requested to intervene. Disputes in Government factories, however, come under the Central sphere, but no such disputes have ever occurred.

D.—LABOUR WELFARE AND THE SALT CESS ACT

The Salt Cess Act, 1953 was passed in 1953 which envisages setting up of a Fund, known as the "Salt Cess Fund". One of the important objects on which the proceeds from the Fund will be spent is:

"Promoting the welfare of labour employed in the salt industry."

In the second Five Year Plan the following provisions have been made:

I. Government Sector :	Amount.
(i) Construction of Creches	60,000
(ii) Construction of Rest-sheds	1,10,000
(iii) Arrangements for Water supply	46,000
(iv) Housing	3,60,000
(v) Educational facilities	45,000
(vi) Medical Aid	1,00,000

II. Private Sector :	Amount.
(i) Construction of Rest-sheds, etc.	5,30,000
(ii) Water Supply	3,80,000
(iii) Housing	4,50,000
(iv) Medical Facilities	2,50,000
(v) Educational facilities	3,50,000

Estimates for implementing the above are being Prepared. Regional Boards have already been set up in the States. There are representatives of Labour on all these Boards. The Regional Boards will formulate schemes for Labour welfare in accordance with the second Five Year Plan and priority will be given to the execution of these schemes. It has been recommended by the Central Board that 20% of the amount of cess collected should be spent on the labour welfare.

CHAPTER XXX

ADMINISTRATIVE SET UP—PAST AND PRESENT

A.—EARLIER ADMINISTRATION

There was generally no uniformity in the matter of administrative control for the collection of salt revenue in the country during early days. The manufacture of salt along the sea-coast in Bengal, Bombay, Madras and the Rann of Kutch flourished as a cottage industry for centuries. Salt manufacture was in existence even at the distant date like Mauryan Period (300 B.C.) supervised by State official named Lavanadhyaksa and the business was carried on under a system of licences granted on the payment of fixed fees or part of the output. The tradition handed down from Hindu kings of old is followed by the Government of India even after the British Regime, who not only supervise the manufacture of salt, but are themselves the most important manufacturers. Different Provinces and the erstwhile Indian States had their own system of administration. The collection of the salt revenue in the Madras Presidency was originally vested in the Collectors of Districts whose controlling authority was the Board of Revenue. As the Collector could not pay proper attention towards this direction of the administration on account of their multifarious duties, the work was entrusted to a separate Department under a Salt Commissioner on the recommendation of a Commission appointed by the Government of India in 1876. The administration of the Salt Department in the Bombay Presidency was conducted by the Collectors of Salt Revenue. As regards administrative machinery in Bengal, the control of the importation and issue of foreign salt was in the hands of the Collector of Customs, Calcutta working under the Central Board of Revenue. The Government of Bengal through the Collectors of districts and the Commissioner of Excise and Salt, Bengal used to administer the inland preventive work, the control of inland bonded warehouses etc. The Northern India Salt Revenue Department was administered by the Commissioner, Northern India Salt Revenue, selected from the Indian Civil Service, who was assisted by a Deputy Commissioner.

During the British Regime, the Government of India appointed a Salt Committee under their Resolution No. 4844 S. R. dated 11th August, 1903 (Finance and Commerce Department) to enquire into the question of salt administration in the country besides other aspects of the Salt Industry. Regarding the administration, the points were as follows:—

- (1) The desirability of amalgamating the Bombay and Northern India Salt Revenue Departments;
- (2) The expediency or otherwise of amalgamating the Bengal and Northern India Salt Revenue Department;

The staff of the Salt Department in different States and regions at that time was as follows:—

(i) *The Northern India Salt Revenue Department.*—Its operations extended throughout the N.W.F.P., the Punjab, Rajputana (Salt works), the U. P. and Agra to Oudh and the Patna and Bhagalpur districts of Bengal.

The following were the Salt works under the Department:—

The Mayo Mines and the other minor sources in the salt range in the Punjab, the Kohat and Mandi quarries, the Sambhar Lake, Pachbadra and Didwana and the Sultanpur works in the Gurgaon district of the Punjab.

It was administered, under the direct supervision of the Government of India, by a Commissioner (with headquarters at Agra and Simla) with the assistance of a Deputy Commissioner. The total strength of the staff was 2,150 as follows:—

<i>Permanent</i>	
Assistant Commissioners	7
Superintendents	29
Assistant Superintendents (excluding Probationers)	7
Inspectors	90
Clerks and Treasurers	128
Petty Officers	182
Peons, Weighmen, Daftaries, and Khalasis	1,468
Medical Officers	2
Hospital Assistants	3
Hospital Servants	7
TOTAL	1,923

<i>Temporary</i>	
Petty officers	25
Peons and Chowkidars	164
Menials	38
TOTAL	227
GRAND TOTAL	2,150

(ii) *The Bombay Salt Department.*—The control of the Government of India over the Bombay Salt Department was exercised through the local Government, subordinate to whom were the Commissioner of Customs,

Salt, Opium, Abkari and the Collector of Salt Revenue and Continental Customs (i.e. Customs outside the island of Bombay). The latter officer was assisted by a Department of the permanent numerical strength of 4,629 and seasonal staff of 1,547, as detailed below:—

	Through- out the year.	For a portion of the year.
Assistant Collectors	10	..
Native Assistant to Collector of Salt Revenue	1	..
Sarkarkuns	34	..
Inspectors, Superintendents and Darogas	68	..
Clerks	553	140
Medical staff	4	..
Petty Officers	468	13
Subordinates (Peons, Boat crews, etc.)	3,491	1,394
TOTAL	4,629	1,547

Throughout the Presidency of Bombay exclusive of Sind, the Bombay Salt Department was entrusted with the prevention of breaches of the Salt Law, the production and sale of salt at the Government sources of Khara-phoda and Dharasna, and the supervision of the excise works.

An important feature of the Salt Department in Bombay was the extent to which it was connected with other branches of the administration. Thus the Commissioner used to supervise also the working of the Customs, Excise and Opium Departments while the Collector of Salt Revenue was in charge of the sea Customs at all ports except Bombay itself and the ports in Sind, and of the Land Customs on the Kathiawar, Goa and Daman frontiers. His supervision extended over the administration of port funds, the Coast guard service and the light houses, while he also used to control the working of the Uran distilleries near Bombay. The close connection of the work of the Bombay Salt Department with the sea was one of the most important factor of the administration.

(iii) *The Bengal Salt Department.*—Under the supervision of the Local Government and the Board of Revenue, the Department was administered by the Commissioner of Excise and Salt. He was assisted by one Assistant Commissioner with his jurisdiction over the districts of Midnapur, Howrah, the 24 Parganas, Khulna and Noakhali, subject to the control of the different District Collectors while a Superintendent was in charge of each of the three districts in Orissa Division, Puri, Cuttack and Balasore. The Inspectors in Chittagong used to work directly under the Collectors of the district. There was practically no licit manufacture of salt in Bengal (except that incidental to the refining of saltpetre,) and the local Department had to deal only with the prevention of illicit practices along the coast, and the supervision of the saltpetre refineries in the neighbourhood of Calcutta.

The actual numerical strength of the Department in Bengal was as follows:—

Assistant Commissioner	1
Superintendents	3
Inspectors	14
Sub-Inspectors	24
Petty Officers	46
Peons	329
Launch and Boat Establishment	144
Clerical staff	29
Refinery Establishment (Calcutta)	5
Menials	19
TOTAL	614

Both the above points regarding (i) the amalgamation of the Bombay and the Northern India Salt Revenue Department and (ii) the Bengal and the Northern India Salt Revenue Department were examined by the above Committee. Regarding (i) they stated:—

“So long, however, as the administration of Salt and Customs in Bombay continues to be connected as at present, we are unanimously of opinion that one single authority cannot control the salt interest of Bombay and Northern India. Any arrangement under which the Collectors of Salt Revenue would be subordinate to the head of a combined Department in all salt matters, and to the Commissioner of Customs, Opium and Abkari as regards Customs, would be unsatisfactory. Unless some change is made in the duties of the Collector of Salt Revenue and the Continental Customs, we consider either that he must remain as at present subordinate to the local Commissioner or that the Director of a combined Department must assume control of Customs both at Bombay and the other coasts of the Presidency. That one authority could efficiently unite these duties with the control of the Northern India Salt Department we do not deem practicable.”

As regards point (ii) the Committee stated as follows:—

“Upon the whole, we think that unless a change in the direction of amalgamation with the larger department of Northern India is desired by the Local Government, it would be preferable to leave matters as they are. The present working of the department is not unsatisfactory, and against possible advantages to be derived from amalgamation, there are drawbacks to be got which perhaps on the whole outweigh them.

“If effect were given to the suggested transfer to Bengal of the district of Ganjam with its important salt works, the position of the Salt Department in Bengal would be materially changed but we do not think it necessary to discuss such a contingency at present.”

B.—SALT AND CENTRAL EXCISE ADMINISTRATION

The Government of India took over Central Excises (on matches, sugar etc.) and decided in January, 1938 to Entrust the collection of excises to the Salt Department.

(i) *Northern India*.—The administration of Central Excises in Northern India was transferred to the charge of the Commissioner, Northern India Salt Revenue, from 1st April, 1938 on a temporary basis.

(ii) *Bengal*.—The question of Centralisation of the Salt Administration in Bengal was considered but it was decided by the Government of India to defer this step until the following financial year. The Salt Administration in Bengal was taken over from the Bengal Government by the Central Excise and Salt, Northern India Department with effect from the 1st April, 1939. This arrangement continued till the 10th December, 1939, when the Northern India Salt Department was bifurcated into two departments viz., the North-Western India and North-Eastern India Departments under two separate Collectors.

(iii) *Bombay*.—The administration of Central Excises in Bombay pertaining chiefly to sugar and match factories in the Province of Bombay, which was hitherto carried on through the Government of Bombay, was transferred to the Collector of Salt Revenue, Bombay with effect from 1st April, 1938. With the Centralisation of the administration of the Central Excise on 1st April, 1938, it was decided finally to abandon the arrangement which had nominally been in force since the 1st May, 1932, by which the Collector of Customs, Bombay, was appointed as the Collector, Salt Revenue, Bombay, in addition to his own duties.

(iv) *Madras*.—The administration of the Madras Salt Revenue Department continued in combination with that of the Madras Land Customs and Outports Departments. With effect from 1st April, 1938, the Government of India transferred the administration of Central Excise Revenue in the Madras Presidency from the Government of Madras to the Collector of Salt Revenue, Madras.

BIFURCATION OF THE N.I.S.R. DEPARTMENT—DELHI AND CALCUTTA COLLECTORATES

The Government of India decided in 1939-40 to split up the Department of Central Excises and Salt, Northern India, into two independent units of administration viz., Central Excise and Salt, North-Western India, and Central Excise and Salt, North-Eastern India, each under the administrative control of a Collector. The bifurcation scheme came into effect on the 11th December, 1939. The jurisdiction of the Department of Central Excise and Salt, North-Eastern India, constituted a portion of the United Provinces comprising the districts of Gonda, Partapgarh, Fyzabad, Bahraich, Jaunpur, Sultanpur, Ballia, Ghazipur, Banaras, Azamgarh, Allahabad, Mirzapur, Banda, Basti and Gorakhpur and the province of Bihar, Bengal, Central Province, Berar and Assam, while the North-Western India Department comprised the United Provinces, excluding the districts mentioned against North-Eastern India and the provinces of the Punjab, North West Frontier, Baluchistan, Delhi and Ajmer-Merwara.

When in 1944, more commodities were excised, it was felt that the charge of the two Collectorates, i.e. North-Eastern India and the North-Western India, was rather heavy. There was trifurcation of the original N. I. S. R.

Department and three Collectorates at Calcutta, Allahabad and Delhi came into existence with effect from January 1944. Their jurisdictions were as follows:—

Calcutta Collectorate:

Bengal and Assam.

Allahabad Collectorate:

U. P. and Bihar.

Delhi Collectorate:

Punjab, N. W. F. Province, Baluchistan, Delhi, Ajmer-Merwara and Rajputana.

CENTRAL EXCISES AND SALT ACT, 1944 AND CENTRAL EXCISE RULES, 1944

When the Central Excises and Salt Act, 1944 (Act I of 1944) was promulgated with the assent of the Governor General on the 24th February 1944 and brought into force on the 28th February, 1944 [F.D. (C. R.) Notification No. III-D. of the 26th February, 1944] the formation of the Collectorates with jurisdiction over Salt Administration as provided under Rule 2 of the Central Excise Rules, 1944 was as follows:—

- (a) Collector of Central Excise, Bombay—the Province of Bombay and the Central Provinces and Berar;
- (b) Collector of Central Excise, Madras—the Province of Madras;
- (c) Collector of Central Excise, Calcutta—the Province of Bengal, Assam and Orissa.
- (d) Collector of Central Excise, Allahabad—the United Provinces and Bihar, and
- (e) Collector of Central Excise, Delhi—the Provinces of Punjab, North West Frontier, Baluchistan, Delhi, Rajputana and Ajmer-Merwara

This Rule also included any officer specially authorised under Rules 4 and 5 to exercise throughout a province or any specified area therein all or any of the powers of a Collector under these rules. There were some changes in the jurisdictions of the Collectors by subsequent Notifications from time to time.

C.—PROPOSAL FOR THE FORMATION OF AN INDIAN SALT BOARD

In connection with the formation of the future salt policy in India a survey of production, distribution and consumption of salt was carried out in 1945 by Sir Harry Greenfield who was then Member of the Central Board of Revenue. He recommended "that a Board known as the Indian Salt Board should be formed and vested with full powers in respect of (a) manufacturing, storing, transporting and distributing salt; (b) importing salt or purchasing imported salt; (c) selling salt whether manufactured by itself or by a licensed manufacturer or imported and (d) controlling the salt industry in all respects". He further recommended that the Board should have power to fix maximum wholesale and retail prices of salt. Sir Harry Greenfield's Scheme envisaged comprehensive control over the production and distribution of salt. He was, however, not in favour of eliminating

private enterprise either in the field of production or distribution. "The task", he said, "is indeed so vast that all the available managerial capacity in both fields will need to be mobilised if it is to be adequately performed and a measure of competition between State and Private enterprise should stimulate efficiency. A Bill on this subject was introduced in 1947 Budget Session of the Legislative Assembly and was later referred to a Select Committee. Government, however, subsequently decided not to proceed with the Bill. The present policy regarding the Salt Industry was declared in the Resolution of the 6th April, 1948; viz. that the salt industry would not be nationalised but it was included in the industries, the planning and regulation of which would be controlled by the Central Government. Under the Constitution of India, "manufacture supply and distribution of salt by Union agencies; regulation and control of manufacture, supply and distribution of salt by other agencies", is an item in the Union list under item 58 of the seventh schedule of the Constitution of India.

D.—PATEL COMMITTEE—SALT EXPERTS' COMMITTEE AND SALT ADVISORY COMMITTEE

Soon after the abolition of duty on salt, the country was partitioned. Due to combination of adverse circumstances there was some chaos especially in regard to rail traffic. At the time of the abolition of duty in 1947, the then Finance Member (Hon'ble the late Mr. Liaquat Ali Khan) stated that "Government's interest in the salt industry should hereafter be entirely positive and constructive and should be directed towards developing India's salt resources to their full potential, improving the quality of the salt and making sufficient grades to provide for all classes of consumers, encouraging increased consumption by individuals and by cattle, producing adequate supplies for industrial use, keeping prices at a minimum and ultimately making India self-supporting in this important commodity." So, in order to examine all the above aspects the Government of India set up an Inter-Departmental Committee in 1947 under the Chairmanship of Mr. H. M. Patel, I.C.S., the then Cabinet Secretary. The Committee submitted within two months a report to Government containing several short and long term plans for the Salt Industry. The recommendations of the said Committee were approved by the Cabinet in December, 1947. The plans included the formulation of measures to set up production of salt in the country, to regulate imports so long as indigenous production fell short of consumption and to improve the quality of Indian salt. This also included the issue of a Salt Control Order giving power to the Government of India under the Essential Supplies (Temporary Powers) Act, 1946 to regulate the quantity, quality, storage, distribution and prices of salt. It was also decided to appoint a Salt Experts' Committee to advise the Government regarding the steps to be taken to improve the production and quality of salt and to reduce the cost of its manufacture in the various Government and private salt factories and also to report on the character and extent of technical assistance and supervision which should be provided by Government to private salt works to enable them to increase the quantity and to improve the quality. The issue of the salt Control Order by the Union Government was not, however, effected as the Ministry first wanted to gain some experience of the industry and later on account of the introduction in the Assembly of the "Industries (Development and Control) Bill" in 1949, this measure was no longer considered essential.

Staff on Salt Work before and after the abolition of salt duty on 1-4-47

Offices	Gazetted Officers		Non-Gazetted Executive		Non-Gazetted Ministerial		Class IV		Medical Estt.		Workshop Estt.		Boat Estt.		Education Estt.		Total	
	Pre.	After	Pre.	After	Pre.	After	Pre.	After	Pre.	After	Pre.	After	Pre.	After	Pre.	After	Pre.	After
1. Headquarters Delhi.	..	9	..	3	..	66	..	28	..	..	..	..	..	..	..	..	..	106
2. Govt. Salt Works in Rajputana and Kharaghoda; in Bombay	14	15	33	44	113	123	555	545	16	14	179	179	..	..	2	3	912	923
3. Bombay .	3	9	37	84	263	83	1,203	561	2	2	..	20	6	14	..	..	1,514	773
4. Madras .	15	10	223	103	156	60	1,287	620	..	..	13	13	..	..	6	4	2,710	810
5. Calcutta .	3	4	39	28	14	21	189	111	..	..	17	17	..	..	..	..	262	181
6. Total private works.	21	23	299	215	433	164	2,679	1,292	2	2	30	50	6	14	6	4	4,486	1,764
GRAND TOTAL .	35	47	332	262	546	353	3,234	1,865	18	16	209	229	6	14	8	7	5,398	2,793

As the Central Excise and Salt were combined during the duty period, some of the above category of the officers were also doing combined duties.

E.—PRESENT SALT ORGANISATION

The Salt Department which formed a part of the Central Board of Revenue under the Ministry of Finance was transferred to the Ministry of Industry and Supply with effect from 1-11-1947, after the abolition of the salt duty (from 1-4-1947). The Department was put in charge of the Salt Controller as the head of the Salt Organisation with his headquarters at New Delhi, and four Regional offices—at Sambhar under the charge of the General Manager, Sambhar Lake, Madras and Bombay each under the charge of a Deputy Salt Controller, and Calcutta with one Assistant Salt Controller in charge. The total strength of the staff employed exclusively for Salt work in the country immediately before and after the abolition of salt duty was as shown in the table at page 553

Salt Experts Committee—A Committee of Salt Experts was appointed in 1948. It started functioning soon after its formation and submitted two interim reports to the Government, the first in June, 1948 and the second in January, 1949. They presented their final report to the Government on the 27th April, 1950.

The Salt Experts' Committee also went into the question of the staff required for the Salt Department and remarked that the Department as constituted then functioned mainly as an agency for (a) issuing licenses to private manufacturers, (b) collecting the Salt Cess, (c) controlling the production at the Government-owned salt works and (d) controlling the distribution of salt on zonal basis. They were of the opinion that the Department was not adequately staffed with technical personnel to give scientific guidance to either the Government-owned or private salt works. They defined the following functions and recommended that in all future recruitment technical qualifications should be insisted upon so that in course of time the Department may be able to shoulder its new duties efficiently:—

The functions of the Department as detailed by the Salt Experts Committee were to see:—

- (a) that the country becomes self-sufficient in salt as early as possible;
- (b) that the quality of salt improves from the low figure of 90 to 92 per cent sodium chloride content to about 96 to 98 per cent as quickly as possible;
- (c) that technical guidance is given to the manufacturers, particularly the backward manufacturers, in modifying the layout of their works with a view to obtaining a higher yield and a superior quality of salt;
- (d) that the production of salt at the Government salt works is conducted on proper commercial basis;
- (e) that the model salt factories and the research stations when set up are conducted efficiently; and
- (f) that salt is distributed economically and equitably throughout the country.

To implement these recommendations, it has been the policy of the Department to recruit persons with high scientific and technical knowledge

On the recommendation of the Salt Experts' Committee in their interim report the Government set up a standing Advisory Committee on salt in August, 1949. It was decided that this Committee would consist of members both from officials and non-officials, which should meet periodically and advise Government on all matters relating to salt.

With the attainment of Independence by India, there came a complete change. Under Section 7 of the Indian Independence Act, the "Suzerainty of His Majesty over Indian States" lapsed. With this also lapsed the entire code except for provisions of any...agreements which relate to Customs transit and Communications, Posts and Telegraphs or other like matters until they were demanded by the Ruler or the Dominion. So, with the gradual 'accession' of the Indian States to the Dominion of India, the present Salt Organisation also began to exercise supervisory check and control over production and distribution of salt in factories located in the Indian States concerned, viz., Saurashtra, Kutch, Travancore-Cochin and Himachal Pradesh. As regards salt administration in Rajputana Salt Sources, there was no change as the old system of control of these salt sources continued.

F.—FEDERAL FINANCIAL INTEGRATION OF STATES

On the acceptance by the Government of India of the recommendations of the Indian States Finance Enquiry Committee 1948-49 regarding the Federal Financial Integration of States, the Salt Administration in all part 'B' and 'C' States, viz. Saurashtra, Kutch Travancore-Cochin, Himachal Pradesh, etc. was taken over by the Government of India with effect from 1-4-1950 and was placed under the Salt Department.

G.—CHANGES IN MINISTRIES CONTROLLING SALT

The administration of the Salt Organisation which started functioning under the Ministry of Industry and Supply from 1-11-1947, was placed under the Ministry of Works, Production and Supply with effect from 1st February 1951, as a result of the reshuffling of the Ministries. Again, due to the further reshuffling of the Ministries the administration of Salt Organisation was transferred and placed in charge of the Ministry of Production with effect from 13th May, 1952.

Change of Designation.—The designation of the posts of the Salt Controller, Deputy Salt Controllers and Assistant Salt Controllers was changed to the Salt Commissioner, Deputy Salt Commissioners and Assistant Salt Commissioners, respectively from May, 1952.

Estimates Committee—its recommendations, etc.—Formation of a Departmental Committee.—The Estimates Committee in their First Report issued in December, 1950 made *inter alia* the following recommendations in regard to the Government Salt factories, and the staff of the Salt Department:—

Para 100 (II): "A small Committee should be appointed immediately to go into the working of uneconomic Government factories and to suggest ways and means to make them profit yielding";

Para 100 (III): "The Committee which we suggest for going into the working of the uneconomic Government factories should also examine the strength of the staff required for the new Directorate of Salt".

As a result of the recommendations of the Estimates Committee, a Departmental Committee was constituted by the Government of India under their orders No. Salt-5(32)/51, dated 7th June, 1951 and 20th September, 1951 with representatives of the Ministries of Production (Shri B. B. Paymaster I.C.S., Deputy Secretary as Chairman and Shri S. C. Aggarwal, Salt Commissioner as Member-Secretary) and Finance (Shri A. Baksi, Deputy Secretary and later Shri B. S. Bhatnagar, Deputy Secretary, Member). They examined the working of the Government Salt Factories in particular and the staff position of the Department in general. They reported on the proper strength of staff required for the Salt Commissioner's office at headquarters and in the Regions. As there were some differences of opinion between the representatives of the Ministry of Finance and the Ministry of Production regarding functions of the Department, the question was, discussed on the 15th January, 1953 by an Inter-Ministerial Committee consisting of representatives of the Ministries of Production, Finance, Commerce and Industry and Natural Resources and Scientific Research (Council of Scientific and Industrial Research), Indian Standards Institution and a few trade interests with Shri A. K. Chanda, Secretary, Ministry of Production, as Chairman. It was decided by this Committee that the present system of licensing, realisation of cess and quality control should continue. It was further decided that the following should be the functions of the Salt Department :

- (i) Quality Control;
- (ii) General development of the Salt Industry;
- (iii) Financing and running of Research Stations and Model Farms;
- (iv) Administration of Government salt factories, their improvement and expansion;
- (v) Realisation of Cess;
- (vi) Arranging the distribution of salt and liaison with State Governments etc.; and
- (vii) Bringing about the consolidation and realignment of small units on scientific lines and giving technical advice to manufacturers and providing common services to licensees as hitherto.

As regards the question of actual staff requirement, the Committee opined that it was a matter of detail which could be worked out in due course.

After the above Inter-Ministerial meeting, the Departmental Committee submitted their Report to the Government on 1st May, 1953. The Government accepted their following recommendations under Ministry of Production's letter No. Salt-6/34/53 dated 23rd January, 1954:—

- “(1) If the present functions of the Salt Department as decided at the meeting held on the 15th January, 1953 are to be discharged efficiently, there is no appreciable scope for reduction in the existing staff.
- (2) The Department should, however, not be prevented from approaching Government for increase in any particular category of staff, if full justification for the same is forthcoming. Similarly, the Government may examine and reduce any staff from time to time if such a course is considered justified on specific scrutiny.
- (3) As regards the Watch and Ward staff, the Committee agreed that it is not practicable to separate staff engaged purely on Government duties, as they perform mixed duties, and there is, therefore, not much point in attempting to cut such staff”.

The functions of the Department were again reviewed in 1955 and it was considered necessary to emphasise certain aspects, which were not specifically considered in 1953. The functions of the Salt Department were, therefore, specified as follows:—

- (1) It has to be kept constantly in view that the primary function of the Department is to develop the Salt Department on sound and scientific lines and its functions should be regulatory rather than controlling, in the sense of imposing controls.
- (2) The objective should be to work towards a stage of maximum decontrol as soon as practicable. In considering this aspect, the principle to be applied is not so much whether a particular control can be removed but rather would a particular control be necessary if it did not exist. To put it in a different language, the existence of any control at present should not be considered as justification for continuing such controls any longer and the Department should, therefore, review the position constantly and work towards a stage when it would be possible to remove all types of controls on salt.
- (3) In case of quality control, it is the view that the standard of purity of salt should be established and should be achieved. Whether the quality of salt could be improved on a voluntary basis or as a result of Governmental measures is open to examination but the aim should be to establish as high a purity in the manufacture of salt as is practicable. The establishment of testing laboratories and of model farms should be taken up as a matter of urgency.
- (4) Government have already decided to treat small-scale manufacturers working in areas up to 10 acres whether they are at present under the licensing system or not, on an equal footing. It follows therefore, that there should be equal treatment of all such small-scale manufacturers.
- (5) As the primary function of the department will be to develop the salt industry, for which large funds will be required, it is considered that the entire amount collected as cess should be spent on the industry itself and in doing so special attention should be paid particularly in sustaining and supporting the small producers.
- (6) Closely allied to quality control is the question of dissemination of technical information to salt producers of all kinds and particularly to enable them to produce their salt by modern and cheap methods and to get the best result for their labour and investment. In this connection special attention should be given to small-scale producers to enable them to improve the quality of their production.
- (7) Encouragement should be given for the formation of salt co-operatives so as to eliminate uneconomic small holdings. This would also help to eliminate the intermediaries.
- (8) The future programme of production should be so regulated that the country should be able to produce quality salt for the export market increasing.
- (9) The byproducts of salt are not always utilized at present. Special attention should be given in future for the full recovery of by-products and the exploitation of those by products.

- (10) It should also be one of the principal items of the programme of the Salt Department to develop salt-based industries. The Department should consider the practicability of establishing industries based on salt and definite schemes should be worked for Government's consideration.
- (11) In the managements of State-owned salt factories, the aim should be to ensure and establish a state of things where workers are partners in the enterprise.
- (12) The possibility of the creation of dumps for salt at suitable centres in the States which will serve as equalising stocks and help distribution, should be examined.
- (13) The Department should also examine the possibility of introducing one uniform price for salt all over the country.

The present set-up of the Salt Organisation is shown in the chart given on the next page.

H.—THE LEVY OF ADMINISTRATIVE CHARGE (CESS) AFTER THE ABOLITION OF SALT DUTY AND THE PROMULGATION OF THE SALT CESS ACT, 1953 (49 OF 1953) AND THE COST OF SALT ADMINISTRATION

A general cess on all salt excluding that at Kathiawar, Kutch and Mandi was levied in April, 1947 when the Excise duty on salt was abolished under the Government of India Finance Department Notification No. 3-Salt/47, dated 28-3-1947. The cess was levied at Re. -/3/6 per maund on salt cleared from Government factories and Re. -/2/- per maund on salt cleared from private salt works. Of the Indian States before their financial integration with the Indian Union, the Travancore-Cochin Government followed the practice of the Government of India and levied a cess of Re. -/2/- per maund. The cess levied by the Government of India was intended to meet (a) the payment of compensation to the Indian States under Treaty obligations and (b) the establishment charges of the Salt Department, including the cost of Watch and Ward staff posted by the Department for guarding salt works. The higher rate of cess on the production of Government salt works had partly been intended to meet the treaty payment to the Indian States and partly to reduce the difference between the selling price of salt from Government factories and private factories.

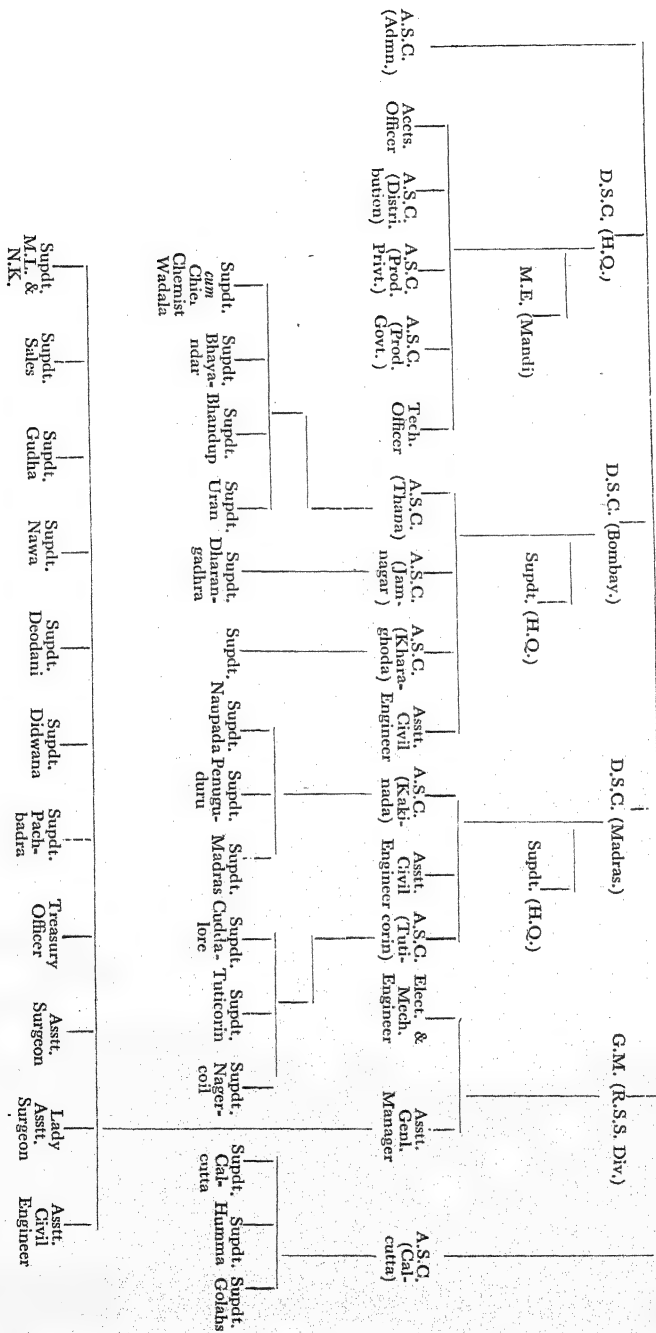
The Salt Cess Act, 1953 (49 of 1953).

The above levy was subsequently regularised by the enactment of the Salt Cess Act, 1953 (49 of 1953) which came into force from 2nd January, 1954. Under Section 4 of this Act, the proceeds of the cess reduced by the cost of collection as determined by the Central Government shall, if Parliament by appropriation made by Law in this behalf so provides, be utilised on meeting the expenditure incurred in connection with the Salt Organisation maintained by the Central Government, besides other objects in connection with the development of the salt industry in regard to quantity and quality; welfare of labour; establishment and maintenance of model farms, salt research stations, etc.

There was a demand from the industry and the Government also felt that the balance of the cess realization after meeting the expenditure on the Salt Organisation, should be utilised for the development of the

SALT ORGANISATION

Salt Commissioner



industry. Government, therefore, set up a Central Board and 6 Regional Boards to advise the Government of India on the administration of the proceeds of the Salt Cess levied and collected under Section 3 of the Salt Cess Act, 1953.

The Regional Boards make recommendations to the Central Board in respect of their regions and the Central Board after examining the same, forwards its recommendations to the Government for their consideration and implementation.

I. SECOND FIVE YEAR PLAN (1956-57 TO 1961-62)

The Plan envisages an expenditure of about Rs.1·90 crores in respect of Government and Private salt works. This expenditure is proposed for the development and other objects as given in the Salt Cess Act above. (The cost of establishment, which comes to about 40 lakhs of rupees per annum for Government and private works, is not included in this amount). The amount is to be spent on the main headings, such as establishment of laboratories, development of works and improvement of brine supply, improvement of water supply, plant and machinery, amenities for staff and labour, medical and educational facilities and is distributed Regionwise as follows:—

I. Private Sector:

	Rs.
Madras Region	59,15,200
Bombay Region	53,26,800
Calcutta Region	9,86,160
TOTAL .	1,22,28,160

II. Government Sector:

R. S. S. Division	47,80,100
Kharaghoda	8,22,000
Mandi	10,97,500
TOTAL .	66,99,600
GRAND TOTAL .	1,89,27,760

CHAPTER XXXI

SALT INDUSTRY IN FOREIGN COUNTRIES

ADEN

The production of solar salt is the one industry indigenous to Aden Colony. Situated approximately at the south western tip of the Arabian Peninsula, Aden is suited ideally to the solar-evaporation process of salt production. Because of the slight annual rainfall in the Red Sea area, the sea has more than the average salt content. Moreover, Aden itself receives almost no rain at all, at the same time baking under a torrid equatorial sun the year round. Four firms are engaged locally in the production of salt. These are:—

(1) *United Salt Works and Co., Ltd. Hiswa Sheikh Othman, Aden.*—The plant has three Diesel engines of 100 h.p. each, 250 r.p.m. owned by Limited Liability Co., formed at Bombay, India. Annual production is 65,000 tons; rated capacity is 65,000 tons. The process and types of equipment used are solar evaporation, Diesel-driven centrifugal pumps, Diesel crushing mills, and lime shaft driven by Diesel. The fuel and power used is Diesel oil. The land area is 800 to 900 acres.

(2) *Little Aden Salt and Industrial Co., Ltd., Little Aden, Sheikh Othman, Aden, Arabia.*—This company has two engines, 160 and 130 h.p., respectively. It is owned by the Private Limited Liability Co., formed under the laws of the Colony of Aden. Production was 50,000 tons in 1949; capacity is 70,000 tons. The process is solar, and the operation is equipped with a Diesel-type pump and one Diesel-type crusher. The fuel and power used is Diesel oil. The area used is 900 acres, but the company actually holds 1,900 acres. The Director is Phirozshaw Pallonjee Patel.

(3) *Indo-Aden Salt Manufacturing and Trading Co., Ltd., Khormaksar, Aden.*—This company has three Ruston oil engines of 80 h.p. each. The company is owned by the Private Limited Liability Co., formed under the laws of Bombay, India. The production in 1949 was 79,000 tons; the capacity was 80,000 tons. The process is solar evaporation, and the operations are equipped with Diesel engines. The fuel and power is Diesel oil. The area used totals 1,000 acres. The Director of the Company at Aden is Ahmedbhey Hajee Laljee, O. B. E.

(4) *Aden Salt Works, Khormaksar, Aden.*—This company has two steam engines of 300 h.p. each, run by marine-type boilers and two generators, 220 volts, D. C., double-phase. It is owned by Agostino Burgarella Ajola (Italian). In 1949, the output totalled 105,000 tons; the capacity was 140,000 tons. The solar evaporation process is used, and they have electrical pumps, electric crushing mills, and electrically driven elevators. The fuel used is crude furnace oil. (Consul L. Pittman Springs, Aden).

The four works produce solar salt basically the same as solar salt is produced in most countries of the world; but as some details are slightly different the method will be described. The only real difference between the processes used by the four companies is that three have to use windmill power (because of its cheapness) to draw sea water to their salt ponds, whereas the fourth, most of whose ponds are below sea level, relies on gravity to fill the salt beds in the initial stages and uses pumps only when the sea water has become heavy brine.

These salt producers produce about 300,000 tons of salt a year and have a capacity of 355,000 tons with the present layout. The industry employs about 1,000 persons, and the companies are family-owned and operated.

The Government of the Aden Colony collects a salt tax of 8 annas (Sh. 0·11) per metric ton on exported salt and a tax of 16 rupees (Sh. 3·15) per ton of salt marketed locally. However, it should be noted that none of the producers whose operations have been outlined in the foregoing are allowed to pack or sell their product in the local market. The entire output must be exported, if sold at all, to earn foreign exchange. Packaged table salt is imported from the United Kingdom for the European colony in Aden, whereas the native population depends on the small "pan" Arab producers in the Colony and Protectorate. Supposedly, the large producers are compelled to export their product in order to protect these Arab home producers, as salt making is their only means of livelihood in a part of the world where labour is abysmally cheap and jobs are hard to find.

Exports

As stated above, the entire output of Aden is exported and the main markets for this salt were Zanzibar, Kenya Colony, Somaliland Protectorate, India and Pakistan, Ethiopia, French Somaliland, Belgium, Nigeria, Belgian Congo, Other British Possessions, Seychelles, Japan, Aden Protectorate Ports and Italian East Africa, etc. So far as India is concerned, she having attained self-sufficiency in salt does not import any salt from Aden.

AUSTRALIA

Australia produces about 2,80,000 tons of salt per annum. This is produced in the States of South Australia, Victoria, Western Australia and Queensland. In Queensland, the salt is obtained from sea-shore pans near Bowen. Due to monsoonal conditions the season is limited to about 2-3 weeks in December. In Victoria, the bulk of the salt output is procured ordinarily from sea-shore pans at Geelong and Laverton, but salt is available in substantial quantities also in a number of lakes in the North Western portion of the State. In South Australia, salt is obtained at the sea-side and from a number of lakes. In Western Australia the output is dependent almost entirely on salt lakes.

Main sources of supply are in South Australia at Will's Creek, a tidal inlet on St. Vincent's Gulf, in the State of Victoria in the shallow salt lakes of the western and north-western districts and from sea-water of coastal stations.

At Will's Creek the water flows for some miles through a series of walled compartments, made either of clay or concrete, until it reaches an arrangement of paddocks known as the outer condensers, further evaporation of the water takes place there until the gypsum content of the brine is evaporated.

In the inner condensers evaporation continues, and a high density of salt results. The liquid containing the salt is then pumped into crystallisers, varying in size from an acre to three acres, and also enclosed in clay or concrete walls.

Processing in the salt lakes of Victoria has been successfully carried out since 1866.

Each summer as the shallow waters evaporate, salt is deposited around the margins of the lakes. Below the salt is a layer of carbonaceous mud not economically workable.

Deposits of salt are in thin layers of from one to three inches deep. In the smaller lakes it is harvested by workers who use a specially designed long-handled shovel.

Salt thus collected is scraped into ridges and allowed to remain until hard enough to bear the weight of a vehicle. It is then carted to the edge of the lake and stacked in large heaps.

These deposits are usually very pure, containing as much as 97 per cent sodium chloride. No further processing is required.

As soon as possible after heaping the salt is bagged, expeditious handling assuring the minimum of loss in the event of rain.

Some of the salt lakes in the Mallee district of Victoria are very picturesque. One of them, known as the Pink Lake of Underbool, is brightly coloured, due to an algal growth which favours a high degree of salinity and is confined to the surface layer of salt. Interesting changes take place in such lakes during the summer months. The thin pink layer becomes desiccated, and capillary action brings up from below a saline solution which on drying, deposits a white network of pure salt.

Gases produced by the decomposition of the algae in the sub-surface layer of the mud, raise bulges in the drying salt crust. These gases smell strongly of hydrogen sulphide.

Assistant Chief Government Geologist of Victoria, Mr. A. D. N. Bain, says that the general inference to be drawn from a study of these lakes is that they are the remains of much larger bodies of water. The shrinking of the large lakes, has resulted in the concentrations of salt now found below the smaller lake beds.

As the lakes dry up in the summer, capillary action brings the salt to the surface and concentrates it there to be brought into solution in the ensuing wet season. This salt is then deposited as a crust when the next summer heat evaporates the water of the lake.

The average output by States is given below:—

	(In tons)
South Australia	2,00,000
Victoria	70,000
Queensland	10,000
Western Australia	7,000

South Australia.—A large proportion of the salt production is from saline lakes in the region adjoining St. Vincent Gulf, particularly on the Yorks Peninsula and at Lochiel and Price. Solar evaporation of sea water is carried out by I. C. I. A. N. Z. at the Dry Creek Works.

Victoria.—Principal production is from solar evaporating pans of the Cheetham Salt Party Ltd. at Geelong and Laverton. The company controls several thousands of acres divided into numerous evaporation basins varying in size from two to ten acres. Harvesting is highly mechanised and

the crude salt is fed to a modern refinery which produces various grades of salt for dairying, domestic, food processing and stock purposes. Saline lakes in north-western Victoria are harvested in the summer months. Imperial Chemical Industries of Australia and New Zealand Ltd. obtain salt for chemical purposes from Lake Tyrrel and Linga Lakes.

Queensland.—Solar evaporation of sea water is carried out by the Bowen Salt Ltd., at Bowen, but no details of operations are available. It is understood that plant extensions are contemplated to raise production to the Queensland demand.

West Australia.—Salt is recovered from saline lakes at Esperance and Widgimooltha and by the solar evaporation of sea water on Rottnest Island and production is from 5,000 to 7,000 per year.

Imports and Exports

Australia imports rock salt from the United Kingdom, Table salt from U. K., Egypt and Netherlands and Dairy salt, etc. from U.K., Hong Kong, Aden and other foreign countries. The total imports range from 5,000 tons to 9,000 tons per annum.

Australia also exports rock salt and Table salt to New Zealand, Fiji, British territories, Japan and a few other countries. The total exports are about 2,000 tons per annum.

Consumption

Consumption of Australia is about 2,30,000 tons per annum.

AUSTRIA

The salt hills of Austria are situated in the heart of the country. They are surrounded by extensive stretches of woods and beautiful flower-covered meadows. More often than not they themselves surround the gorgeous deep-green seas of the Salzkammergut. Austrian salt works look back on centuries of tradition which has been maintained by its workers and employees. Originally the drying houses of the Austrian salt works were worked by the system of firing the works by means of wood. Since the second half of nineteenth century, the advantage of developing technical sciences found their application in the salt industry. In the nineties of the last century electricity was introduced and later thermo-compression plants installed for the manufacture of fine salt.

The Austrian salt deposits extend from Marzell in Styria across Admonz to Bad Ischl, Hallstatt and Bad Aussee whence they can be traced further across Hallein. Berchtesgaden, Reichenhall and Lofer to Hall in Tyrol and finally to Switzerland. The Salt mines run by the Austrian salt works are situated in Upper Austria underneath the Plassen near Hallstatt in Perneck near Bad Ischl in Styria in the Alt-Aussee salt hill on the Sandling, in Salzburg in the Durnnberg near Hallein and in Tyrol in the Hall valley under the Windanger. The central management of the Austrian salt-works is effected by the Head Office with its seat in Vienna. Head office is further more in charge of the salt-works administrations of Ebensee, Bad Ischl, Hallstatt, Bad Aussee, Hallein and Hall in Tyrol. The oldest traces of mining are to be found in Hallstatt where as far back as the

days of the Celts, salt was prospected. In 1311, the first galleries were opened in the salt hill of Hallstatt. The youngest salt deposit to be opened out in Austria is in Perneck near Bad Ischl where exploitation started towards the middle of the 16th century.

The brine obtained from the salt-hills by the process of lixiviation (some of the material has as much as 70% salt contents) is conducted by pipe-lines from the hills (these brewing houses were formerly called pan-places) where it is evaporated on fire or steam pans. Such plants are found in Aussee, Ischl, Hallstatt, Hallein and Hall, each producing 15,000, 8,000, 6,000, 15,000 and 9,000 tons respectively, the oldest of which, the little salt-pan in Thaur near Hall in Tyrol was already set going in the 9th century, in Hallein in the 12th century, in Altaussee, approximately in the 13th century, in Hallstatt towards the beginning of the 14th century and finally in Bad Ischl approximately in the course of the 16th century.

Originally wood was employed for heating the pans. However, for reasons of the threatening scarcity of wood at the salt-works Hallstatt, Aussee and Ischl on the one hand and the shorter and cheaper means of transportation to the main salt depot (Gmunden) on the other, the Emperor Rudolf II, had a brewing house built in Ebensee which, thanks to its extremely favourable position, developed by and by into the largest brewing house of the Austrian Alp lands.

The salt-works at Ebensee (producing 55,000 tons) were consequently modernly equipped with a new vacuum plant. This extension, however, could not be quite terminated due to the outbreak of the last world war. Now-a-days, the salt-works at Ebensee where the brine of the salt hills Hallstatt, Aussee and Ischl is being manufactured, successfully deals with the evaporation of half the salt produced in Austria (total production approximately 1,08,000 tons yearly). Due to the modernized plant, the production costs of salt are lowest at the Ebensee salt works.

A strong will of reconstruction rarely to be observed, was shown by the Austrian salt-works after the second world-war. They were one of the first enterprises to resume the production again after the world war. In 1946, salt production was already again about 80,000 tons.

During the same year preparations were commenced for the setting up of a new compression plant in Hall in Tyrol following the pattern set by the Swiss and in autumn 1948, the first spade-dig was made for the plant of the new work. The annual production of this plant is 9,000 tons.

The central management of the Austrian salt-works with head office in Vienna, employ approximately 200 employees and approximately 1,500 workers, the larger part of which is pragmatically employed.

Working conditions, too, were adjusted to modern times after the second World War and the Austrian salt-works can proudly point out to the fact that with regard to social institutions, they always figured amongst those enterprises which in this respect rank among the first of the country.

In 1949, approximately 76,000 tons of salt were produced of which altogether 74,000 were used for home requirements in table, cattle and industrial salt.

During the war exports got a set back, but by the end of 1949, exports rose to 10,000 tons of salt in the Yugoslav barter agreement for 1950 and concluded a further supply contract for 4,500 tons of salt to be exported to Czechoslovakia.

The Austrian salt production for which a monopoly exists is entirely in the hands of the State, so that no private person is allowed to produce salt or brine. The prices for salt and brine are fixed by the Ministry of Finance. The revenue from the production and sale of salt goes to the State and includes the salt taxes.

BURMA

Salt has been manufactured in Burma by boiling brine as a cottage industry from times immemorial. Local manufacture went on in most of the littoral areas in the Arakan, Irrawady, Pegu and Tenasserim Divisions. In the Arakan Division it was manufactured in the Aeng Township and Island of Ramree. In the Irrawady Division Bassein and Myaungmya Districts were the chief centres of manufacture. In the Pegu Division large areas on the banks of the Sittang estuary provided saline earth for the manufacture of salt, while in the Tenasserim Division the Districts of Amherst, Thaton, Tavoy and Mergui produced salt from brine concentrated in the numerous creeks. It was obtained by the combined process of solar evaporation and boiling. Shallow pans were made in the hard clayey banks of the tidal creeks; brine was concentrated in these and was then run off to a well where all impurities got precipitated—clarified brine was then boiled and salt obtained. About 1832 Government established salt Golas at Kyaukpyu in Arakan. Salt was purchased from the manufacturers and transported to Chittagong. In those days, the manufacture and sale of salt was absolutely free but subject to an excise levied in the shape of a licence of 4 annas on every earthen pot and Re. 1 per iron boiler employed in the manufacture.

Prior to the passing of the Indian Salt Act, 1882, Salt administration in Burma had been controlled under the Lower Burma Land and Revenue Act, 1876. The customs duty applicable at the time had been 3 annas per maund levied under the Indian Tariff Act, 1875. The same duty was levied on local salt and the composition rates varied from 2 annas to 12 annas per earthen pot and from Re. 1 to Rs. 5 per iron cauldron. In 1882, Indian Salt Act came into force. Up to first War, however, the duty was paid at much lower rate. The duty in Burma since the War followed the Indian rates in case of Direct Duty paying districts. The Composition Duty fee, however, was still fixed at a rate relatively much lower than the excise duty.

Burma gets its supply from the following sources:—

- (1) Salt manufactured from sea-brine in eight districts on the coast in Lower Burma known as Direct Duty salt.
- (2) Composition Duty salt produced in ten districts of Upper Burma in which efflorescent deposits or brine wells occur.
- (3) Foreign salt imported direct from foreign countries, or
 - (a) re-imported from Indian ports;
 - (b) salt manufactured in India and imported from Indian ports.

All salt consumed in Burma is of the fine white crushed variety.

(i) *Direct Duty Salt*.—This is manufactured in Akyab, Kyaukpyu, Sandoway, Hanthawady, Bassein, Thaton, Amherst and Mergui districts.

Salt is obtained on the sea coast by boiling sea brine which has been previously concentrated by solar evaporation. Sea brine works are situated on the banks of tidal channels and creeks along the coast. They are located in swamps or low lying localities not above the level of high tide. For these works an abundant supply of brine and an impervious soil are essential. A factory requires at least four or five acres of land, but the better factories make use of 15 to 30 acres. The factory has a boiling shed and a godown; the boiling shed is lofty and airy 30' to 50' long and 30' to 40' broad.

Sea water is trapped in channels and creeks every spring tide. It is elevated to a reservoir and then run by gravitation through a series of condensers, where its density is increased, by solar evaporation, to approximately 25° Be', i.e. the saturation point at which calcium sulphate or gypsum ceases to be deposited and the deposition of common salt commences. The dense brine is then run into a storage tank. From a sump in this tank a pipe leads the brine into a well inside the factory.

Factories usually commence laying out their evaporating beds in November as by that time most of the rain water disappears. For this work the average number of labourers employed in a factory is six. These labourers remain employed until the fields are completed at the end of December when the number is reduced to three or four. They are then employed on boiling the concentrated brine and on keeping the fields in repair. The production of salt commences in January and continues until the stock of concentrated brine in the brine tank is exhausted or until it is so reduced in density by rain water that it is unprofitable to boil it down. The rains begin in May and cease in October and most of the better factories manage to continue boiling until August or September. Licensees are trying to improve concentration process so as to enable production to continue throughout the year. Payment to labour is made in a somewhat unconventional manner. The licensee feeds his men and allows them to take supplies of cigarettes, matches, curry stuff etc., from local shops up to a small amount and at the end of the season gives them a small sum of money. The total average remuneration in kind and cash amounted to about Rs. 14 a month for a labourer, and Rs. 18 to Rs. 24 a month for a headman.

The number of factories worked under this system was 214 in 1930-31, 186 in 1931-32, 185 in 1932-33, 155 in 1933-34, and 117 in 1934-35. The number of boiling pans employed was about 500. During 1934-35 out of 117 factories licensed 57 were in Amherst District and approximately produced three quarters of the total output of the province. The total output from the Direct Duty districts varies from about 7 to 9 lakhs of maunds per annum.

(ii) *Composition Duty Salt*.—This salt is manufactured in Upper Burma districts. A restriction is imposed on the size of brine boiling vessels licensed and a composition fee based on the maximum possible output of each vessel is fixed and hence the salt thus produced is called Composition Duty Salt.

An area of saline earth is selected and thoroughly ploughed. Weak brine is then lifted from an adjacent well. The wells are of all sorts, some round and some square. The brine is drawn by means of *picotahs* or by using a rough pulley wheel with a rope and double buckets. The brine is allowed to run in narrow channels over the ploughed land and artificial

efflorescence is obtained. The soil is ploughed and broken and elaborate processes are followed in preparing it and admitting the brine into it. Two months may be occupied in obtaining the first crop of salt efflorescence and one month for each succeeding crop. These operations are carried on under the heat of the sun. The efflorescence is scraped up and lixiviated in bamboo baskets shaped like inverted cones in earthen filters. This brine comes out into an earthen pot from the filter and is then boiled down for salt in the manufacturers' houses or sheds. Meantime the process of drawing brine through the salt impregnated earth is repeated at the filter. Small mud furnaces with one or two bowl-shaped cast iron cauldrons of 7 gallon capacity are used. The process of boiling is continued to complete evaporation. Boiling goes on from February to June i.e. in dry season. The manufacturer pays a composition fee based on the capacity of the cauldron used and is otherwise free from all control.

In some areas where the rainfall is comparatively heavy, the above process is varied by three cauldrons being used. Weak brine is placed without any preliminary concentration into the first cauldron and passed on as it increases in density to the second and finally to the third where it is boiled until its salt content is deposited. About forty to fifty thousand maunds of salt approximately 6 per cent of Burma's total output, are annually produced under this system. The number of Composition Duty licenses in 1930-31, 1931-32, 1932-33, 1933-34 and 1934-35 was 629, 641, 741, 759 and 761 respectively. The number of vessels employed was about 900 with a total capacity of about 4,800 gallons.

The Composition Duty districts are Magwe, Pakokku, Myingyan, Yamethin, Shawebo, Sagaing, Katha, Meiktila, Upper Chindwin and Lower Chindwin. The bulk of the salt, however, is manufactured in the Shawebo, Sagaing and Lower Chindwin districts.

Production in olden days (1889-90) was about 4 lakh maunds. It gradually rose to about 10 lakh maunds in 1934-35 (9.25 in Direct Duty areas and .75 in Composition Duty areas). About 1947-48 the output was 2,70,000 viss.

Cost of production in Direct Duty areas and Composition Duty areas was as follows:—

Direct Duty Areas	Re. 0 3 7 per maund (in bigger factories).
	Re. 0 6 6 per maund (in smaller units).
Composition Duty Areas	Rs. 1 2 1 per maund.

In addition to local produce salt was imported into Burma from the United Kingdom, Germany, Spain, Aden, Port Said and Italian East Africa. Imports since 1890 to 1935 varied from 15 to 25 lakh maunds per annum.

The selling price varies from Rs. 5 to Rs. 13 per maund depending upon the distance of the place of distribution.

CANADA

Canada is one of the biggest salt producing countries which annually produces about 7.5 lakh tons of salt. Salt occurs in different forms in many provinces, such as Nova Scotia, New Brunswick, Ontario, Manitoba, Saskatchewan, Alberta and Northwest territories and British Columbia.

In Nova Scotia no deposits of salt have been discovered, but numerous saline springs are known to occur. Salt is manufactured on a commercial scale from brine of these springs from time to time. The salt, however, is not able to compete with the Ontario salt or that imported from Great Britain or U. S. A. and there is no large scale production of salt in this province. New Brunswick also has brine springs just as Nova Scotia.

Ontario is the centre of salt industry of Canada. The salt is recovered by evaporation of brine which has leached out rock salt from beds which occur in the Salina formation near Lake Huron; the St. Clair river; lake St. Clair and the Detroit river. The salt beds vary in thickness. Production from a few wells is sufficient to supply the domestic demand.

In Manitoba also numerous brine springs exist from which salt is recovered by evaporation.

Salt springs are also known to occur in the Prairie provinces of Saskatchewan and Alberta. These have, however, not been economically important owing to their inaccessibility to ready markets. Moreover, very little is known about them and so far no definite attempt has been made to excavate rock salt in this area.

In British Columbia salt occurs in the form of a number of saline or mineral springs and salt is prepared by evaporation.

The production of salt variety-wise and province-wise is given below:—

<i>Production Variety-wise</i>		(In short tons)
Name of the variety	Quantity	
Fine Vacuum salt	2,82,711	
Coarse-grainer salt	19,419	
Mines rock salt	25,908	
Salt produced for chemical purposes	4,13,223	
TOTAL	7,41,261	
<i>Production Province-wise</i>		(In short tons)
Name of the Province	Quantity	
Ontario	6,19,598	
Nova Scotia	61,799	
Alberta	34,613	
Manitoba	25,251	
Saskatchewan	8,000	
TOTAL	7,49,261	

Imports and Exports.—Canada's imports of salt are chiefly of grain sizes and of purities not obtainable in the country.

Canada imports about 2,50,000 short tons of salt and exports about 5,500 short tons of salt.

The annual consumption of Canada is about 10,50,000 short tons.

Uses and Prices.—Salt is used chiefly in the chemical industries and extensively for household and food purposes. The coarse grades of salt are used in the curing of fish, for ice and dust control on highways and in refrigeration. The prices of the specially purified salt, fine industrial salt and coarse industrial salt vary greatly.

There is no control on the salt industry in Canada and no duty is levied there. There is no definite standard fixed for salt in Canada except that it must conform to the Pure Food Standards and salt for human consumption should be of the standard as laid down by the Food and Drug Division of the Department of National Health and Welfare.

CEYLON

Ceylon is a small island but has a long coast line. It is situated in the Tropics within the monsoonal belt so that bright sunshine, heat, strong dry winds and droughts are present. Fine clayey beds on the coastline eminently suitable for solar evaporation are available. These factors have helped Ceylon to establish the salt industry which has been going on from times immemorial. The usual solar evaporation system is adopted. Sea-water is taken into salterns and is exposed in successive stages to the evaporative effect of sun and wind. The most troublesome constituent of the brine is the magnesium portion. This retards the rate of evaporation and also contaminates the salt production and introduces serious corrosion problems. The original process called for nothing but man-power. But now-a-days, power is used to pump the brine from place to place.

Production from 1940 to 1951 has varied between 500 to 1,000 thousand cwts. The annual consumption of Ceylon is about 50,000 tons.

Salt is manufactured either (a) by private parties under excise supervision of salt officials; or (b) salt formed irregularly in Crown "leeways" with very little control; or (c) in 'model' salterns by Government officials with hired labour and with careful control and mechanisation.

The three groups produce almost equal quantities, that is, 30 to 35 per cent of the total production. Salt is collected by hand using wooden implements and is carried on head to carts or lorries which carry it to *Kottus*—thatched sheds—for storage. Most of the difficulty arises over transporting the salt. Salt is a Government monopoly and Government takes it from the *Kottus* at fixed rates. Some years ago, Government started model salterns which follow standard modern practice. A saltern consists of a reservoir, sub-reservoirs, primary condensers, secondary condensers, feeder ponds, salt crystallisers and bitterns ponds. Salt is sold to a wholesaler at fixed rates throughout the island. Retail stores have also been opened throughout the island at which salt is sold direct to retailers. Most of the salt is consumed within the country.

Several areas are admirably suited for production of salt in Ceylon. The United Nations Adviser has recommended that salt factories should be concentrated at Elephant Pass, Puttalam and Hombantota. The Adviser's idea is that consumption will gradually rise within ten years to 80,000 tons and the production should also be stepped up to that figure. Elephant

Pass is the most important area as it is on a railway line and can produce half the total quantity. The other two areas are a bit far and transport has to be done by lorries to the rail-head. The raw material of Elephant Pass (Jaffna and Lagoon brine) is also the best in Ceylon. Capital investment of several lakhs is required for pumping machines, etc. and for the development of these areas.

CHESHIRE (UNITED KINGDOM)

The Cheshire salt industry is one of the oldest industries in England. The wonderful free-flowing brine springs of Cheshire round which grew up the ancient salt towns of Nantwich, Middlewich and Northwich, were certainly known at an early date. Prior to the Roman occupation salt was obtained from them by the simple process of puring the brine over faggots of burning charcoal and scraping off the crystals as they formed. The Romans themselves introduced the system of evaporation in open pans set over a fire, a method which remains unaltered in principle to this day. As late as the 17th century the brine springs rose almost to the surface, without need of pumping. The 17th century saw two important changes in the Cheshire salt trade. The first was the introduction of iron evaporating pans heated by coal, a measure which to a large extent freed the industry from the control of the timber-owning gentry.

Mining, however, was started some 200-250 years ago only. The salt deposits are enormous. The deposits are found in Northwich, Winsford, Nantwich, Middlewich and Lawton districts. There are two beds of rock salt about 25 and 35 yards thick total thickness being about 180-200 feet. In the Northern district the salt beds have an area of at least 3 sq. miles and taking the above proved thickness the salt reserves in this district alone come to 892,108,800 tons. In Winsford district the salt beds have an area of 6 sq. miles and an average thickness of 65 yards or 195 feet. The salt reserves come to 1,932,400,000 tons. The other three districts also contain large quantities of salt. At one time many small mines existed, but they were gradually abandoned. At present only one rock-salt mine is being worked.

Rock salt mining as well as preparation of refined salt under open pan and vacuum crystallising system are carried on. Mining is done in the Meadow Bank Salt Mine. Two beds of the thickness of about 150 feet are being worked. Mine is served by normal shafts and is worked on the pillar and stall system like the coal mine.

The bulk of the rock-salt is sold in lumps varying from 14 to 96 lb. in weight, as mined. In this form it is used for 'cattle licks' and, in addition to the home market, is exported to Canada, Australia, New Zealand and all parts of the Empire. The remainder is crushed on surface and sold for agricultural purposes, being shipped in barges down the river Weaver.

The greater part of the salt produced in the area is obtained from natural brines pumped from a depth of about seventy yards below the surface. From the wells it is delivered into reservoirs or wooden cisterns, whence it is run into the evaporating pans as required. In appearance the brine is indistinguishable from limpid water, yet it is the strongest in the world, holding one quarter of its weight of pure salt in solution. The present day pans in use at the Imperial Chemical Industry's works at Winsford vary in length from 60 to 100 feet, and in width from 25 to 30 feet. Their depth is about 2 feet. These pans are constructed of riveted steel plates resting

on brickwork fire flues. Furnaces at one end supply the heat, which is drawn beneath their entire length. As the brine warms and begins to 'work', the salt forms on the surface in flakes or sheets resembling thin ice. From time to time these break and fall to the bottom of the pans. The lower the temperature at which evaporation takes place the harder and larger are the crystals of salt formed.

Various kinds of salt, such as salt blocks, salt for fisheries, salt for agricultural purposes and salt for cattle called cattle licks are prepared. There are hundreds of pans and many large stores. Salt is exported to West Africa, Lagos, Trinidad, etc.

Lagos salt is a variety specially prepared for the West African trade is also produced in the form of blocks, but these are subsequently ground by machinery in order to make the particular light-weight product in demand among the natives.

Vacuum Salt.—The other system in force is the vacuum crystallisation. In the open pan system about three tons of coal are required to produce 5 tons of salt, but in this system about a ton or so is enough to produce that quantity. This method, however, requires a big initial capital expenditure and skilled supervision.

The vacuum plant at Winsford consists of three cone-shaped evaporators approximately 50 feet high and 18 feet in diameter. Inside these cones are some 2,000 vertical tubes through which the purified brine passes, whilst hot steam circulates around them. As the heat evaporates the water, the salt falls through the tubes to the bottom of the pan, whence it is elevated to rotary filters. The salt crystals, now containing 3 to 3½ per cent of moisture, fall on to a conveyor belt which takes them either to the dryers or to storage, as required. Undried vacuum salt is largely used by soap makers, aniline dye manufacturers and for water softening plants. The dried vacuum salt, on the other hand, is subsequently sifted graded into what is known as 20 and 40 mesh, i.e. into salt which will pass through a sieve with 20 meshes to the inch and that capable of passing a sieve with 40 meshes to the inch. The finest salt is packed by machinery and sold in cartons for table use. Of the remainder, the greater proportion is used in the making of margarine, and for export to butter-producing countries such as Denmark and New Zealand.

In some salt iodine is mixed in a certain percentage for goitre. This salt is called 'Iodized Salt'.

The production is about 7 lakh maunds per year.

FRANCE

France is one of the big salt-producing countries in Europe; annual production of different types of salt being about 10,00,000 tons (2,70,00,000 maunds) and about half this salt is consumed in industries, agriculture and fishing. About 10-12 per cent is exported and the rest, about 35 to 40 per cent is used for human consumption. Salt is obtained from mines or from brine under vacuum system of evaporation or from sea-brine under the usual solar evaporation.

Methods of Production

Three processes are used in France to produce salt:

1. *Mining process*—which consists in sinking a well in saliferous ground and in extracting the rock-salt by knocking it down in form of blocks which are afterwards pulverized.

Thus is obtained a raw-salt good enough only for industrial or agricultural purposes.

2. *Industrial process*—which consists in evaporating a saturated brine extracted from sub-soil by boring in the saliferous ground. This evaporation can be carried out in different types of apparatus, the rectangular stoves, the round stoves or vacuum apparatus (triple effect).

The salt obtained by these different processes in Salt-works called “Saline ignigene” is refined salt or “ignigene”.

Another process of refining has been recently perfected; it consists in dissolving the rock-salt extracted from the mines and decant the mass in melting, to conserve only the pure salt by casting.

The salt obtained by this process is called “Sel de flamme”.

3. *Agricultural process*—which consists in cultivating the sea-salt in “salterns” by evaporating the sea-water circulating on large surfaces by the effect of the sun and the winds.

Geographical Division

The salt mines and “saline ignigenes” which are the industrial portion of the production, are geographically divided into three principal regions of production:

1. *The Group of Lorraine*.—(Meurthe-et-Moselle, Moselle) 17 Salt Works including 3 salt mines.

2. *The Group of Franche-Comte*.—(Jura, Doubs, Haute-Saone) 4 Salt Works, including Salin d' monmorot producing 20,000 tons.

3. *The South West Group*.—(Basses-Pyrenees, Haute Garonne Aigmortes and Berre, Vitrollis) 4 Salt Works.

On the other hand the agricultural portion of the salt production is divided into two groups:

4. *The Southern Group*—which spreads out its 25 salterns in the Districts of Aube, Herault, Bouche-du-Rhone and Var.

5. *The Western Group*—constituted by numerous “cottage industries” exploitations (roughly 2,000) spreaded on the Atlantic Coast or in the Island between the Penninsula of Quiberon and the Mouth of the Gironde.

Distribution

The salt being a cheap and heavy material, the effect of the transport charges is considerable. In order to prevent this effect, the Manufacturers have agreed to conciliate the safety of the supply for the country and the

distribution of the production on the big part of its territory by creating collective selling organisms with regional character which limit, in principle, their activity to the nearest zone to the regional works whose interest they administer.

The organisms are:

1. For the South . . . LA COMPAGNIE DES SALINS DU MIDI ET DES SALINES DE DJIBOUTI, SFAX ET MADAGASCAR 68, Cour Gambetta, MONTPELLIER (Herault).
2. For the West . . . LA COMPAGNIE DES SELS DE L'ATLANTIQUE. Rue du Lieutenant Nicol-Le, POULIGUEN (Loire-Inf.).
3. For the Lorraine . . . LA SOCIETE COMMERCIALE DES SELS 5, Rue Girardet, NANCY (Meurthe-et-Moselle).
4. For the Franche-Comte . . . LA SOCIETES DES SALINES DE FRANCHE COMTE 20, Avenue Carnot, BESANCON (Doubs).
5. For the South-West. . . LE COMPTOIR DE VENTE DES SELS DE BAYONNE Villa Biahizpa, route de Biarritz, BAYONNE.

Salt Production

(In tons)

Year	Rock Salt	Refined Salt	Sea Salt	Total
1946	205,394	196,196	476,823	875,413
1947	252,759	228,783	473,130	954,672
1948	164,156	261,147	418,386	863,789
1949	182,633	267,203	679,236	1,126,073
1950	100,490	255,165	604,340	960,000

Consumption

Year	Human Consumption	Agriculture	Industry	Exports	Fishing	Total
1946	3,52,757	62,498	2,77,610	135,982	25,730	8,54,577
1947	4,20,986	52,899	3,01,418	192,359	35,681	10,03,343
1948	3,84,288	67,918	3,28,649	325,190	49,663	11,55,708
1949	3,38,917	48,445	3,44,033	178,485	45,730	9,55,610
1950	3,56,851	59,040	3,80,729	106,879	46,096	9,49,595

ITALY

The manufacture and marketing of sea-salt in Italy are controlled by the State on a monopoly basis.

Salt is manufactured in Italy mostly by solar evaporation of sea-water either by accretion or by single irrigation system. The former seems to be the method of choice and is preferred. In the accretion system the crop is harvested only once in the season. Brine of density not less than 24 Be. is charged into the crystallisers with beds generally prepared by ramming with bitterns kept over from the preceding year. The ratio of the area of the crystallizers to that of the reservoirs and condensers varies from 1 : 6 to 1 : 10 depending on the initial density of the brine and the method of manufacture adopted. Use of very shallow (2-3") condensers (in single irrigation system) with continuous movement of brine in them, spraying of mother liquor rich in magnesium chloride on dust raising areas close to the crystallisers or on the space round about salt storage to prevent excessive contamination of salt by dust (due to the hygroscopic nature of magnesium chloride dust settling down on it) and protection of brine against dilution by rain are some of the other interesting features of the Italian system of manufacture. Special measures are adopted to prevent excessive dilution of brine by rain. The crystallizer and final condensers have openings in the sides fitted with shutters to drain off the rain water, which is lighter than brine, from the surface of brine into waste channels. The last set of condensers are emptied into crystallisers to protect the crust of the bed when a storm is imminent. Sometimes brine from crystallisers is run into special pits on the approach of rain.

The sources of production are the littoral salterns which are situated at Cagliari, Carloforte, Cervia, Comachio, Margherita di Savoia (producing 3,00,000 tons) and Tarquinia which together produce an average annual quantity of 500,000 metric tons; the rock salt mine at Lungro, with an annual production of rock-salt lumps of about 10,000 metric tons, and the inland saltern at Volterra which annually produces on the average 13,500 metric tons of refined salt and about 2,500 metric tons of ground salt.

The littoral salt works exercise their activities during the months of April to October. After preliminary operations, about the end of May, brine is admitted to the salt pans and the process of crystallization by solar evaporation begins, and lasts for about three months.

When evaporation decreases with the approach of autumn, the collection of the salt is taken on hand, the systems used varying in different salt works.

The breaking-up of the salt incrustation, which reaches an average thickness of 10 cm. and which on account of the cohesion of the crystals is difficult to cut, is carried out by means of special shovels or as is usual in Margherita di Savoia, by means of axes.

Transport from the salt pans to the seasoning yard is effected by means of wagons on a network of narrow-gauge lines and here the crystals are gathered into prismatic heaps by belt conveyors and mechanical hoists with hourly capacities of 50, 60 and 100 cubic metres. These operations are at present being executed in some of the largest salt works, with a special

patented mechanical device, which is being gradually extended to other salt works. This device performs all the operations mechanically, *viz.* the collection, transport and storage of the salt with a great saving in expenditure and noticeable improvement in the quality of production.

The Cervia salt works follow a special working system of their own. They are composed of 150 little salterns each independent from the other, and entrusted to the care of workers who are under a special contract with the State Monopoly, and having an interest in the production. Here the salt is removed from the crystallizing pans every three or four days and is collected in the vicinity to be later transported and delivered to the State Administration, which stores it until the end of the season.

The production of sea salt which, as already stated, amounts annually to about 500,000 metric tons is disposed of as follows:—

- 320,000 m. tons for sale for table and other household uses (at 5,000 lire per quintal) (1 quintal=220 lbs.).
- 60,000 m. tons for the production of industrial and dairy salt. (This salt is sold at 2,000 lire per quintal only to those industries that are legally allowed to buy salt at this special price.)
- 20,000 m. tons to those industries which are legally allowed to buy salt free of tax (at 300 lire per quintal.)
- 100,000 m. tons for export.

Salt-products which are exported are entitled for the refund of duty on the salt used, the amount of the refund being fixed each year by the Budget. At present, it is equivalent to 70% of the sale price.

JAPAN

In Japan, the material for the salt manufacture is exclusively seawater because of the non-existence of rock salt, salt well, or salt lake. Of various salt manufacturing processes which utilize seawater, the two processes, solar evaporation and direct boiling, are important. The former uses almost natural forces, but as for the latter the fuel problem and, in connection with it, the mechanical problem are confronted.

Broadly speaking salt industry of Japan has been subject to pressure by imported foreign salt which was viewed with apprehension that it was in no way advisable to leave the industry of daily necessity depending upon foreign country. With the outbreak of the Russo-Japanese war in 1904, it was decided to adopt the policy of protecting and promoting domestic salt industry under the financial monopoly system. In January, 1905, the Salt Monopoly Law was promulgated, as the result of which the Regulations governing Organisation of the Ministry of Finance was amended so that the Monopoly industry section and monopoly technical section were established in the Taxation Bureau as the Central administration for salt monopoly. Salt experimental station, Monopoly Bureau, was established in 1909 at Bofu City, Yamaguchi Prefecture. With the inauguration of the Japan Monopoly Corporation another salt experimental station was created at Odawara in Kanagawa Prefecture so as to complement research works.

Salt requirements of Japan are about 2 million tons; 1 million tons for industrial use and 1 million for human consumption (including tannery, fishery, food preservatives, etc.). Out of this, indigenous production is of

the order of 5,00,000 tons, thereby depending on imports for about 1.5 million tons. The Japan Monopoly Corporation controls salt in all its aspects, namely, indigenous production, imports and consumption. Indigenous producers of salt are required by law to make applications to the Corporation designating the kind of product, process of manufacture, location of source capacity per annum of the installation, etc. There are over 1,500 licensees in Japan for commercial production of salt and they operate about 1,500 installations employing about 40,000 workers. Most of these installations are located in North Shikoku and Southern Honshu Islands. The plants are worked both by coal as well as electricity. The cost of production, however, is very high as the source of energy, either coal or electricity, is very costly. The cost of production is about 35 to 38 dollars per metric ton as against 9.5 per ton c.i.f. for imported salt. The indigenous and imported salt are put to different uses; indigenous salt is used as table salt, for making Miso, Soya bean paste and other pickles and also for preservation of fish for export markets, whereas the imported salt is almost entirely used for the manufacture of soda ash and caustic soda. They require cheaper salt so as to produce caustic soda and soda ash at very competitive prices both for internal consumption as well as for export markets. The production of salt during the last 10 years has been as follows in Japan:—

Year	Quantity in metric tons
1945-46	1,84,294
1946-47	2,01,144
1947-48	96,844
1948-49	2,92,776
1949-50	3,95,964
1950-51	4,26,544
1951-52	4,43,162
1952-53	4,50,702
1953-54	4,54,620
1954-55	5,42,132

Before the second world war, the average production of salt in Japan was about 6,00,000 metric tons.

Japan imports salt from Spain, United States, Egypt, Italy, China, Aden, India, Bahama, Taiwan (Formosa), Thailand, French Somaliland, and on an average imports about 15,00,000 tons.

The figures for some of the years are given below:—

Year	Quantity of salt imported (metric tons)
1951	17,98,205
1952	14,69,692
1953	11,87,146

Distribution

The Japan Monopoly Corporation tries to maintain a stock of about 4 to 5 lakh tons in reserve. Besides, it tries to import about 1 lakh tons every month for the smooth running of the distribution system.

Salt consumers normally register their requirements about 2-3 months in advance and when the intimation of the arrival of the vessel is given to the Corporation, they check up the requirements of the factory and instruct the importer to divert the vessel to certain factory directly so that unnecessary transport is reduced. It is a normal practice at all ports of despatch that surveyors and authorised representatives of the Corporation draw samples, and get them analysed.

NETHERLANDS

Salt stratum was discovered in the soil of the Netherlands about 1895 accidentally when water in a well was found to have a salt taste. Later on drilling indicated that the wealth of salt was very great indeed—so great that salt-making in Netherlands could supply the world's demand in salt, which amounts to 25 million tons a year for one hundred years. The Royal Netherlands Industry started the exploitation of the salt strata about 1918.

No Mines, but Drilling.—Salt making here does not take place in salt mines, but by means of drilling. Wells are drilled down to 300 to 400 m., where the salt strata to be exploited are to be found. Into the drilling-holes tubes are lowered which reach down to the top of the salt strata. Subsequently, thinner tubes reaching to the bottom of the salt strata are lowered into the said tubes again. Then water is pumped into the ring-shaped space between the two tubes, and this water comes into contact with the salt at the end of the outer tube. Thus a salt solution—called brine—is formed, which is driven to the surface through the inner tube by the pressure of the water pumped in. With the aid of pipelines the brine is forced to the works, where it is collected in big tanks, which it leaves again as salt after a series of chemical operations and after evaporation. Two methods are applied for this, viz. boiling in pans and evaporation with the aid of a vacuum. According to the method used the salt is called pan-salt and vacuum-salt.

Various Types.—There are, however, also other distinctions. The Royal Netherlands Salt Industry manufactures a number of types of salt prepared in a special way, *inter alia* the so-called "Jozo". Ordinary drinking water generally contains insufficient quantities of iodine, a substance which is indispensable to the human body. A shortage of iodine may result in a disease of the thyroid gland, the so-called goitre. To make up for this shortage of iodine, salt to which a little iodine has been added is manufactured. "Jozo" cannot be considered a remedy against goitre, but it does act as a prophylactic. For cattle another type of iodized salt, "Joveezo", is manufactured. A third special kind "Badzo" bath-salts which, on being dissolved in water, produce carbonic acid. This salt really has healing properties. In fact, it is a remedy against rachitis, scrofulousness, rheumatism, nervous disorders, corpulence, and disorders of the mucous membranes.

At the chemical department of the Royal Netherlands Salt Industry the salt is worked up to a number of special products, e. g. natron lye, caustic soda, sodium hypochlorite. Further there is "Konezol", a disinfectant for dairy and preserving factories.

Port for Coasters.—Salt-making, which started near Boekelo, is gradually shifting to Hengelo, where a large new works has already appeared. The reason for this movement is that Hengelo is situated on the Twente-Rhine Canal, which was completed in 1935 and is also accessible to coasters. As a result of this, international shipping around the Royal Netherlands Salt Industry—which is established at about 20 miles from the sea—grew very lively. Ships from various countries arrive here to fetch salt, especially salt for the industry. The Netherlands has become an important salt supplier for many countries, particularly the Scandinavian countries and Belgium, which do not have any salt strata of their own, so that the Netherlands has become all the more important as salt supplier.

The only producer of salt in the Netherlands is the N.V. Koninklijke Nederlandse Zoutindustrie at Hengelo.

Considerably more salt is already being produced than is needed in the Netherlands. Before the war half the production was exported, a quantity which is now being approximated again. And it is to be expected that more salt will shortly be available for export, since the annual production that may be attained is estimated at 4,00,000 tons, while only 2,00,000 tons of salt a year are required by the Netherlands itself.

Production, imports and exports of salt in Netherlands for a few years are given below:—

Year	(Figures in '000 kilograms)		
	Production	Imports	Exports
1937	132,000	124,280	69,854
1938	164,000	101,699	93,291
1939	200,000	100,036	127,638
1940	209,000	76,971	97,948
1941	156,000	76,431	76,397
1942	194,000	58,742	85,516
1943	194,000	72,166	77,970
1944	124,000	30,395	59,714
1945	54,000	7,275	2,641
1946	180,000	50,794	66,336
1947	241,000	81,083	131,704
1948	249,000	106,281	153,386
1949	330,000	40,324	183,265
1950	413,000	61,524	259,904

The Dutch consumption of salt amounts to 180,000 to 200,00 tons annually, only a part of which is intended for human consumption. Its use for industrial purposes, in particular by the chemical industry, is still increasing.

There is no control on salt production or distribution in Netherlands. The excise duty has also been abolished now.

PAKISTAN

(i) *Sind Salt Sources.*—The existence of salt deposits in the desert of Sind and along the sea-shore near Karachi has been known for a long time. The deposits have been mentioned in all the records since the British occupation. Salt beds of Saran and Darwari were noticed over a hundred years ago by Sir Charles Napier. Solar salt was manufactured to some extent about 1875. The salt works were centralised about 1880 on the Moach Plain and the Maurypur Salt Works were first started. Since 1925 four other private salt works were permitted to manufacture salt and export it to Calcutta. These were:—

- (1) Grax Limited Salt Works;
- (2) The Star Salt Manufacturing Co., now called Gulbai Salt Works;
- (3) The Laxmi Salt Works, Ltd.;
- (4) The Edulji Dinshaw Salt Works.

The area in which salt is at present being manufactured near Karachi is a strip of beachland forming one shore of a shallow creek. The beach is about 5 miles long and varies in width from 300 to 1,000 yards. The Beacon Hill—a long hillock about 70 acres—divides the beach into two roughly equal parts. Weather conditions at Karachi are very favourable to salt manufacture and Karachi has various natural advantages. Rainfall is very light ranging from 2" to 17" per annum. It occurs in July and August. Thus the working season is fairly long and evaporation goes on for about 300 days in the year. The soil which contains a high percentage of clay is impervious and thus suitable for salt cultivation. Brine is of high density and is directly irrigated into the pans. Grax Company have cement pans which are very useful for manufacturing a pure quality of salt.

Sea breezes blow and are helpful to evaporation. The only trouble is that dust storms are rather frequent. An output of 90 tons per acre per annum is possible. All salt works follow the usual system of manufacture from sea as elsewhere.

Production from 1880-81 to 1926-27 varied from 2 lakh maunds to 5 lakh maunds per annum. When the new works were opened, production gradually increased and rose to about 12 lakh maunds in 1931-32 and to about 32 lakh maunds in 1939-40. The present production is about 41 lakh maunds.

(ii) *Punjab Salt Sources.*—(a) *Salt Range, Khewra.*—The history of the Salt Range is shrouded in mystery, but it is certain that the Range must have been noticed by man in very ancient time, and utilised for the supply of salt. Alexander the Great noticed that the Indian mountains contained salt. These mines are also mentioned in 'Ain-i-Akbari' and portions worked by the Sikhs still exist. The Geologists consider that the salt range must have been formed in the enclosed bays or lakes formed out of the slowly receding Tethys sea which once covered the Punjab, the Himalayan region, Rajputana and other parts of Asia. When the waters of these lakes evaporated layers after layers were deposited and formed salt seams which cropped up from the Jhelum to the Indus, a distance of 134 miles. The range occupies a breadth of 4.5 miles, the area of the salt bearing strata is about 600 sq. miles in which salt seams of varying thickness—100 to 273 feet are found.

Several mines were being worked here and there but since 1870 work has been concentrated at three places, Khewra, Warcha and Kalabagh. The Khewra mine is the largest mine in the West Punjab and is situated near Pind Dadan Khan, a Sub-Division of Jhelum District. The mine hill rises to a height of 700 feet above the Khewra gorge. There are several seams varying in thickness and are in the aggregate from 270 to 700 feet. The seams are separated by bands of pure marl or unworkable salt. The salt varies from pure white to deep red but is remarkably pure. In olden days many small mines were worked and were approached from surface by numerous low winding tunnels which were abandoned as soon as marl was struck. Since 1870 the mine has been worked from top downwards in a series of alternate pillars and chambers running parallel to the dip of the strata. The pillars are dividing walls between one chamber and the other and support the roof. There are several levels running along the strike of the seam and some of them are served by tramways. The mine is worked on the system of coalmines though it being a hill there are no shafts. Self-acting or gravity inclines and inclines served by an electric winch and an electrically operated endless rope haulage are used to lower or raise the salt to the main level. The salt is hauled in rakes of tubs driven by locomotives to the depot. Electric chain-cutters as well as compressed air drills are used for mining.

Production in olden days was only a few lakh maunds but since 1910 till 1948-49, it has been in the neighbourhood of 30 lakh maunds. Since 1950 the production has fallen to about 10-15 lakh maunds only as the Indian portion of Punjab, etc. stopped importing rock salt from these mines. The cost of production has varied from Re.0-4-0 to 0-6-0 per maund during recent years. Salt was subject to duty till 1947 when it was abolished. However, just after the partition a duty of Rs. 2/8/- per maund was again levied by the Pakistan Government which is the present rate.

Salt revenue is deposited by the dealers in different treasuries in the province and salt is issued to them directly from Khewra depot. Salt is issued in bulk. In olden days salt was supplied to Kashmir, Punjab, Delhi, portions of U. P. and Bihar. Since the partition, in 1947, salt is mostly consumed in the West Punjab (Pakistan) only.

A crusher plant was installed at Khewra in 1930-32 with a view to supply crushed salt to Bengal. The scheme, however, did not prove a success owing to the long lead and heavy railway freight to Calcutta. Dust salt from the mine is given to the Imperial Chemical Industries' caustic soda and soda ash plant at Khewra. This is an important subsidiary industry. Quarrying of gypsum has also been going on for some years. Gypsum is supplied to cement factories.

(b) *Warcha*.—This is a much smaller mine and is situated in the Shahpur district of the West Punjab (9 miles from the Gunjyal railway station). The mine is a replica of the Khewra mine on a much smaller scale and is being worked on the same scientific principles as the Khewra mine. It is served by two tunnels, the total thickness of the seams is over 100 feet. The seams are of excellent quality and there is less intermingling of marl and salt than is the case at Khewra. There is a power house and a compressor and cutting is done by compressed air drills. The production varied between 1 and 2 lakh maunds up to 1915. Since then the production has been rising and was about 6-7 lakh maunds at the time of partition (1947). During the last few years the output has been about 2-3 lakh maunds only. The system of sales is the same as at Khewra. This salt, however, was more popular in certain districts of the Punjab than the Khewra salt.

Kalabagh.—Kalabagh has salt quarries which have been worked from times immemorial. They are situated on the right bank of the Indus opposite the town of Mari in Mianwali district of the West Punjab. The quarries are open excavations on the eastern face of the Saudagar hill. During recent years, however a mine has been developed. The strata of Kalabagh has been much contorted and salt is found in isolated masses of varying sizes and varying degrees of purity and texture. Many seams varying in thickness from 4—20 feet are found. There is no tramway and the salt is carried on pack animals to the sale depot on the right bank of the Indus. The output varied from 1–2 lakh maunds up to 1915 and from 1915–16 to 1947–48 between 3–4 lakh maunds. Since the partition the output has fallen down to a couple of lakh maunds only. The salt is purchased by the traders at the depot and they make their own arrangements for taking it across the Indus over the boat and filling it into wagons.

The Punjab Salt Mines were administered originally by the Inland Customs Department, later by the Northern India Salt Revenue Department and later by the Collector of the Central Excise Department. Since the partition the mines are under the control of the Collector of Central Excise, Lahore.

(iii) **N.W.F.P. (Kohat) Salt Quarries.**—The Kohat salt quarries came under the control of the British Government when they annexed the Punjab in 1849. The mines were then owned by fierce mountaineers or local chieftains. The mines were worked by the British more on political than financial considerations. It was not possible to raise the duty which was kept at a very low figure. From 1870, five mines were worked but ultimately two of them were abandoned and for many years only three mines or quarries Jatta, Bahadurkhel and Karak—are being worked. The Kohat quarries are situated in the belt of the low range of the hills that runs along the southern portion of the Kohat district stretching from near Bannu to Duleepgarh eastwards to the Indus. It is considered by geologists that the Kohat salt range is only trans-Indus extension of the Punjab Salt Range. The salt is considered to be of Tertiary age. The area occupied by this range is about 1,000 sq. miles and about 1/5th of the area is taken up by salt which occurs in marked exposures. Huge reserves exist. Ratton places the contents of salt to 20 cubic miles. Rock salt at certain places forms bold cliffs rising to several hundred feet on either side of the hills. In colour the Kohat salt is of varying tinges; grey with transparent blotches; at some places it is darkish. The greyish tinge is due to slight bituminous admixture.

The salt is excavated with blasting powder and the usual iron jumper with chisel point and was issued in irregular pieces just as at Khewra. An attempt was made to convert the Kohat quarries into mines but was not successful. At Bahadurkhel the salt bed is of great thickness and salt is obtained by quarrying at the centre of the anti-cline. Formerly salt was obtained in slabs known as 'tabbis' about a foot square and about 4" in thickness, detached from the sloping face by means of pick and wedge without the use of gun powder. All salt, however, is now obtained by blasting. The production right from 1870 has varied from 5–6 lakh maunds. The production of these quarries has not been affected by partition and continues at about the same figure. The traders have, as usual, to deposit money in the treasuries and issues are made at the quarries from where they make their own arrangements to take the salt on pack animals or lorries. The quarries were worked by the Punjab Government up to 1890 when they

were transferred to the N. I. S. R. Department. The Kohat Division was one of the Divisions of the N. I. S. R. Department under an Assistant Commissioner. Since the partition, the mines are under the control of the Collector of Central Excise, Lahore.

RUMANIA

Geological

The salt-bearing geological formations in the Rumanian Peoples' Republic belong to the Neogene period. Geologically, Rumanian territory consists of the Carpathian chain as the main structural element, both peripheral regions comprising all the structural units on its slopes: the Moldavian plateau, north and south Dobrogea, the Rumanian plain beginning on the southern slopes of the southern Carpathians, the Transylvanian depression between the southern Carpathians and the Muntii Apuseni (Western Carpathians). Stratigraphically and tectonically this Carpathian chain may be divided into three segments: the eastern Carpathians, southern Carpathians and western Carpathians.

Two distinct methods of salt exploitation are in use in the Rumanian Peoples' Republic:

- (a) exploitation of solid salt by the usual mining methods;
- (b) exploitation by underground dissolution in wells.

Rock salt deposits in Rumania are generally in dome form. Domes are deposits with appreciable dimensions in both directions (ranging between several hundred metres and several kilometres).

There are about 300 known salt domes and over 2,000 salt springs, occurring throughout the entire salt-bearing zone already described.

Of this vast number of salt deposits only seven are in exploitation, amply satisfying both internal and export requirements. Deposits for exploitation have been selected as rationally as possible from the geographical view point, with a special eye to avoidance of uneconomic railway transport. There are three varieties of salt: The white, the stratified and the grey. This classification is due not only to difference in colour, but also in structure.

(a) *White Salt*—Appears as a compact aggregate with a predominance of large, milky-white or transparent crystals, welded or bound to each other by smaller crystals forming a sort of binder. The large crystals, up to 20 mm. in size, become readily distinguishable in a polished cross-section or on the cleavage surface of a test sample. While salt is very heterogeneous, the size of its crystals ranging between 1 mm. and 21 mm. Due to subterranean pressure the crystals are crushed and elongated in certain directions. Contact surfaces between the crystals are toothed, which greatly increases their cohesive force.

(b) *Grey salt*—Currently known as "earth-salt", is also an aggregate of crystals consisting of smaller elements than those of white salt and separated by thin interpolations of anhydrite or argillaceous powder, probably of aeolian origin.

It is to these interpolations, which are also very often impregnated with bitumen, that grey salt owes its characteristic colour.

(c) *Stratified salt*—Is a variety forming a transition between the first two kinds and consists of large, transparent crystals joined to each other by smaller, darker crystals.

The Rumanian salt is of very high purity. A full analysis of medium quality strained salt is given below:—

Sodium chloride	99.30%
Calcium chloride	0.20%
Magnesium chloride	0.10%
Calcium sulphate	0.30%
Sodium sulphate	nil
Magnesium sulphate	nil
Substances insoluble in water	0.10%
Humidity	0.02%

After it has been mined the solid salt is used either in unprocessed form (blocks and lumps) for industrial purposes and animal consumption or in processed form.

Salt is prepared for human or industrial consumption by means of the following operations:

Concussion, Grinding, Sorting, Iodising, Packing.

Concussion is performed in crushing outfits or in mills with hammers. The grinding is done in mills with rollers or disintegrators. The sorting of ground salt is done in the sieving plant and various granulations are obtained as required and according to the sieving mesh. Salt is also iodised. A solution of water and iodine potassium is used in this process. The dose is 30 milligrammes iodine potassium to 1 kilo. ground salt. The iodising plant consists of a reservoir of anticorrosive material with air compressor, pipes, jet nozzle and conveyor belt. The salt is placed on the conveyor belt and iodised by a continuous jet of pulverised solution of iodine potassium.

Salt products obtained as described above are as follows:

- (i) Kitchen salt, Stas 1465—50 brand.
- (ii) Industrial salt, Stas 2906—51 brand.

Packing is mechanically performed, either with automatic weighing scales for 50-kilo. bags, or by packing-machine for half kilo. and 1-kilo. parcels.

Only the superior grades for human consumption are packed in one-half and 1-kilo. parcels.

Salt Consumption, Sale and Legislation:

(a) *Salt consumption.*—Rock salt, either in solid or brine form, is destined for human, animal and industrial consumption.

Annual single human salt consumption is known to be 7-8 kilos. Adding the amount consumed by animals, available statistical data enables total salt consumption per head of inhabitant to be estimated at about 12 kilos. p.a.

(b) *Sale of salt.*—Salt for human consumption is handled by each salt mine for the relevant one allotted to it. Salt mine distribution zones roughly correspond to the administrative divisions in regions and districts. Commercial units in each distribution zone place orders and contracts direct with the mine.

The salt is transported from the mine to the distributive units by rail and to a slight extent by motor-vehicles.

Exports.—The country exports salt to neighbouring countries, some of which are totally or partially lacking in salt deposits;

The Yugoslav Federal Peoples' Republic;

The Bulgarian Peoples' Republic;

The Hungarian Peoples' Republic.

Salt is also exported to more distant countries mainly by sea from Constanta. About 50% of the total output of rock salt is exported.

Salt legislation.—Salt exploitation was a State monopoly before the industrial enterprises were nationalized.

This State monopoly dates back to the most ancient times. Nowadays, pursuant to the provisions of the R. P. R. Constitution salt like every other natural resource of the soil and sub-soil, belongs to the peoples' democratic State, the Rumanian Peoples' Republic.

Salt is exploited by mining enterprises organised on the principle of Socialist economy under the control and co-ordination of the Ministry of the Chemical Industry through its General Directorate of Mining Exploitation.

SPAIN

Salt in Spain is manufactured by the following methods:—

- (a) From sea-brine—by evaporation by sun and heat.
- (b) From inland brine—by artificial evaporation.

About 12,00,000 tons of salt are produced annually from sea-brine and about 3,50,000 tons are manufactured from inland brine. The manufacture from sea-brine is much quicker and about three times the salt is produced by sea-brine than by inland sources during the same period. There are many firms engaged in the manufacture of salt, but the following are some of the big firms:—

Salinera Catalana—Apartado 170, Alicante.

Salinera Espanola—Plaza Palacios, No. 11, Barcelona.

Union Salinera de Espana—General Sajurjo, 58, Madrid.

Consorcio Salinera Gaditano—Av. Generalisimo, 159, Cadiz. (This group consists of 75% of the salt pans in the province of Cadiz.)

Salinera Gaditana—Plaza de Espana, 3, Cadiz.

Union Espanola de Explosivos—Castellana, 20, Madrid.

Solvay y Cia—Velazquez, 35, Madrid.

Purasal S. A.—Requete Aragones, 7, Zaragoza.

Gollosal S. A.—Remolinos (Zaragoza).

No control of any kind either on production or distribution is exercised in this country.

Spain is self-sufficient in salt and does not import salt from anywhere else. She, however, exports about 4,00,000 tons of salt annually.

The following table shows the percentage of salt used for various purposes:—

	Per cent
Domestic use	40.5
Agriculture	2.4
Industries other than chemical	12.4
Cattle	2.5
Chemical industries	39.7
Other purposes	2.5

SWITZERLAND

Switzerland is a confederation of 25 States of which 24 are members of a joint-stock company for the supply of salt and the "United Swiss Rhine Salt Works". Only one Canton, that of "Vaud", owns its proper small salt works at Bex. Switzerland produces about 1,10,000 tons of salt per annum. Until 1900 salt produced in Switzerland was pan salt which was coarse-grained. It was produced in shallow iron vessels called 'pans' and they were heated with any fuel that came to hand. Triple-effect vacuum plants were set up early in the twentieth century. In these brine was evaporated not under atmospheric pressure but under reduced pressure. Later thermo-compression plants were produced by the Escher Wyss Engineering Works and began to be utilized for the production of salt. The Swiss Rhine Salt Works possess three plants, namely, Schweizerhalle (producing 60,000 tons) and Rheinfelden-Riburg (producing 40,000 tons) and Bex (producing 10,000 tons).

The rock salt layer is 500 feet under the ground. Sub-soil water runs down through the bore-holes and dissolves the salt into raw-brine, which is pumped to the salt works. The stone-builder, which are in the brine are taken out in a purification plant. To obtain the salt in solid crystal form, the purified brine is led in the Thermo-Compression plants, where the water is evaporated by using electric power. After crystallizing in the evaporators, the salt is conveyed to the separation and drying section. The salt is filled at automatic sacking and packaging machines into bags or boxes, which are directly loaded in railway wagons. Salt produced with the thermo-compression plants is of high purity. Special salt for chemical industry has a purity of 99.97 per cent NaCl. The table salt is at least 99.7 per cent.

The following table gives a survey of the production of the last years:

Year	Cooking salt (tons.)	Industrial salt (tons.)	Total Production (tons)
1935	42,200	27,800	70,000
1936	41,300	28,200	69,500
1945	41,300	32,700	74,000
1946	39,000	44,000	83,000
1947	42,600	54,400	97,000
1948	41,500	58,500	100,000
1949	40,000	46,500	86,500
1950	40,600	54,900	95,500
1951	45,000	67,000	112,000

Each canton is independent and purchases the salt at the United Salt-Works to sell it in its own districts.

During the past two years, Switzerland has imported salt from France only, as follows:—

	1949	1950
Rock Salt	10,000 kgs.	10,000 kgs.
Sea Salt	250,000 kgs.	260,000 kgs.

TURKEY

Types of Turkish Salt

There are four types of salt in Turkey:

1. Marine salt.
2. Lake salt.
3. Rock salt.
4. Salt extracted from Subterranean waters.

These, with the exception of rock salt, are mostly produced during the summer months under the hot sun. As for rock salt, this is obtained by exploding gunpowder in the galleries carved in the districts of production.

There are at present 51 salt-works in operation in Turkey, one of which produces marine salt, 2 lake salt, 7 rock salt and the rest manufacture salt from subterranean brine.

All the salt-works are operated under the supervision of the technical personnel of the Monopolies.

Distribution of salt

While the production of salt in Turkey is under a Monopoly, its sale is free. The greater part of the public's requirements is met by private trade, in addition to which there are 135 Monopoly warehouses scattered all over the country. These warehouses serve to stabilize the price of salt in the various districts. The needs of these warehouses are calculated on the basis of sales during the previous years and of local demands, and are established to cover 12 months' sale and 6 months' stock, that is to say, shipments from the salt pans are scheduled to meet 18 months' requirements.

Figures relating to the sale at the salt pans and from the monopoly warehouses of coarse, table and kitchen salt for a few years are given below:—

Year	Coarse (tons)	Table (tons)	Kitchen (tons)
1947	238,100	923	1,579
1948	232,680	510	1,810
1949	252,444	639	1,606
1950	249,711	775	1,541
1951	245,698	648	1,959

Out of the average total production of about 300,000 tons about 250,000 are consumed locally.

Exports.—For the present exports are effected solely from the Camalti Marine Salt pans in Izmir. These pans are being enlarged with the object of allotting the additional salt produced to the foreign trade.

UNITED STATES OF AMERICA

The world's annual production of salt is about 35 million metric tons of which U. S. A. alone produces about 15 to 18 million metric tons. U. S. A., therefore, is the largest producer of salt in the world. The evaporated salt and the rock salt are the two types of salt produced in this country. The production during the last few years was distributed as follows:—

Types of salt	1944-48 (average)	1949	1950	1951	1952	1953
Rock salt.	3,259,894	3,124,637	3,562,738	4,229,449	4,143,573	4,044,565
Other salt	11,019,234	11,002,165	11,523,492	14,102,056	13,587,217	14,814,803
TOTAL	14,279,128	14,126,802	15,086,230	18,331,505	17,730,790	18,859,368

Salt occurrence is very widely distributed throughout the country. The various modes of occurrence include crystalline layers interbedded with other sediments, which may have been chemically precipitated, as gypsum or may be ordinary clastic sediments, as sandstone and shale; in beds of dry or nearly dry lakes, marshes, or alkali flats; or in the form of dissolved salt, in natural brines or bitters issuing from salt springs or accumulated in salt lakes or ponds. Numerous deposits occur in widely separated areas, but the main producing States are California, Kansas, Louisiana, Michigan, New York, Ohio, Texas, Utah and West Virginia. Although no great amount of salt is produced at present in Pennsylvania, the potential sources in the State recently aroused a good deal of interest.

U. S. A. can be divided roughly into two areas, eastern and western. In the eastern area the salt occurs in the earth, being protected from solution by impervious strata of shale and limestone. In the western section, owing to the arid conditions, salt exists on the surface of the earth as well as in deposits. It is possible to see the processes of leaching, accumulation, and deposition being carried out at various places. Thus the division into two areas is not only geographic but also climatic.

The New York State deposits are the oldest worked deposits in this country. They were formed by the evaporation of the Silurian Sea which covered most of central North America during geological ages. The saline remains occupy two basins, one forming the New York-Pennsylvania-Ohio deposit and the other the Michigan-Ontario deposit. Evaporation was never completed, so no potash deposits have been found. Several evaporation cycles are indicated by the succession of layers of limestone, gypsum, and salt in the deposit. An area in excess of 1,100 square miles is underlaid with salt, ranging from surface level to 1,500 feet below the surface and in beds up to 500 feet in thickness. Thus an inexhaustible supply

of salt attracted early chemical industries and the Solvay soda process was first located here. The State Geologist of New York estimated that there are nine cubic miles of salt in New York itself.

The Michigan deposit ranks first as a producer of salt producing both rock salt and brine. The presence of other chemicals in the brines was responsible for the location of the Dow Chemical Company at Midland, Michigan, which began the production of bromine from brine. The magnesium industry of the United States was developed there because of the occurrence of magnesium chloride in the brine. The State Geologist of Michigan estimated that the salt deposits of that State would serve the needs of that country for five million years at present rate of consumption.

The Permian Salt Basin deposit extending over parts of Kansas, Colorado, Oklahoma, Texas and New Mexico covers an area of about 1,00,000 square miles. Evaporation was completed in one of the deposits giving rise to the potash minerals at Carlsbad in south-eastern New Mexico. Rock salt is mined at various locations in this area but production is relatively low because of the smallness of the related chemical industry.

Texas and Louisiana along the Gulf coast possess interesting salt 'domes' associated with petroleum and sulphur deposits. These domes rise through as much as 25,000 feet of sedimentary deposits and often form mounds or domes contrasting with the surrounding flat country. The diameter of the salt 'plug' varies, and in the largest dome (Hockley, Texas) it is 3 miles wide by 4 miles long and at least 5 miles in depth. The top of the plug may be covered with a cap rock of gypsum and limestone. The prevailing theory is that the salt has been forced upward at numerous points of least resistance from a basic salt stratum by plastic flow caused by the pressure of the overburden.

California possesses salt in practically all forms: rock salt, salt lakes and springs and the ocean. Solar evaporation of sea-water is practised extensively.

Natural Brines

The high salinity of the waters of closed basis is due to a cyclic process which comprises the leaching of the connate salts by fresh water, the flowing of the salt solution into the lake and evaporation of the water. Some lakes are saturated solutions while others are dry deposits during the summer and covered with water in wet seasons. The remains of such lakes, now evaporated and covered with drift form natural deposits in many western States. The composition of the brine depends on the connate salts occurring in the surrounding country but it is chiefly saline or alkaline. The best known is the Great Salt Lake of Utah, the chief remnant of Lake Bonneville which covered a vast area in geological time. In composition the water is quite similar to sea-water but the content of calcium and magnesium is lower. During winter months the solution precipitates $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$.

Nevada possesses a number of alkaline lakes; geological lake Lahontan once covered 8,400 square miles in the north-western part of the State and the small alkaline lakes and many alkaline and saline deposits are the remains of that once great lake. California also has a number of lakes resembling those of the Lahontan basin. There are in the Ohio Valley-Kanawha area and in the Saginaw Valley of Michigan underground brines from which are produced salt, calcium and magnesium chlorides and bromine. Like the solid salt deposits, these brines were formed during past geological ages; they

are termed 'fosail' brines. West of the States of Kansas, Oklahoma and Texas, there are no commercially exploitable halite deposits other than some dried-up desert lakes, and these are commercially unimportant. Salt production in this western area relies upon the solar evaporation of the waters of the Great Salt Lake in Utah and of sea-water in the State of California.

Salt is produced (a) by dry mining, (b) by the use of or the evaporation of saturated brine when salt is mined hydraulically, and (c) by solar evaporation of sea-water.

In the United States there were 48 salt evaporating plants (including solar evaporation installations) in 1951, scattered through 13 States and Puerto Rico. There were 18 rock salt mines in eight States and 17 brine production operations distributed among 7 States.

The United States salt industry is highly organised; it comprises fewer companies than when small crude works with primitive methods and equipment methods and equipment eked out salt for local needs, but concentration of output brought about by modern inventions and methods of production has improved the quality of the produce greatly and accelerated production.

Methods of Production

The production methods for securing salt may be enumerated as:

- (1) Mining of rock salt.
- (2) Evaporation of solutions:—
 - (a) By solar evaporation;
 - (b) In direct-fired evaporators;
 - (c) In grainers;
 - (d) In vacuum evaporators;
 - (e) In flash evaporators.

Mining methods employed for rock salt are similar to those used for bituminous coal, except that rock salt is hard enough so that pillars can be left, making mine timbering unnecessary. Depths and vein thicknesses vary from mine to mine. At the Retsol (New York) mine the shaft is 1,063 feet deep and the salt vein 9 to 10 feet thick while the shaft of the Morton Salt Company operating in the Grand Saline dome (Texas) enters the salt dome at 213 feet but drops to a working level at 700 feet. Mining at the latter level takes place in rooms or 'stopes' 60 feet wide by 80 feet high. The mined salt varies from 18-inch lumps to fines and is brought to the surface in hoist-skips which dump into bins. A coarse screen separates the large lumps from smaller lumps and fines. The large lumps pass through jaw or rotary crushers and all the material then passes through a series of screens and roll crushers to give a product graded in size from 2-mesh to pass 12-mesh. This fine material and discoloured salt is made into brine and evaporated. Fines also are compressed at 24,000 pounds per square inch into blocks for cattle licks. Sulphur and other medicants can be added.

Consumption, Marketing areas, etc.

The major portion of salt produced is used for industries such as chlorine, bleaches, chlorates, etc., soda ash, dyes and organic chemicals, soap, textile processing, hides and leather, meat packing, fish curing, butter,

cheese and other dairy products, canning and preserving, other food processing, refrigeration, livestock, agriculture and general farm use, highways, railroads and other dust and ice control, water treatment, metallurgy, etc., etc., the highest quantity (about 7 million tons) being used for soda ash. The per capita consumption in U. S. A. works out to 206 lbs. per annum on account of large use in industries.

Evaporated salt which is the highest grade is of three kinds according to the method of manufacture: (i) granulated, made by the vacuum pan process; (ii) medium or flake, made in grainers or open pans; and (iii) solar, refined and sold as granulated. As a rule, the faster the brine is evaporated, the finer the size of the salt obtained. Vacuum pans and the Alsberger process consequently make the finest and solar evaporation the coarsest. Grainer salt is the intermediate size.

The granulated, or vacuum grade, comprises the chief portion of table salt marketed and some of the high grade industrial salt for food preparation. The latter is used, among other things, for canning, dairying and baking. Table salt, according to the United States Food, Drug and Cosmetic Administration, is fine-grained crystalline salt, containing, on a water-free basis, a maximum of 1.4% calcium sulphate, 0.5% calcium and magnesium chlorides and 0.1% insoluble matter. Grainer salt is also used for canning and dairying where the flaky type of salt is desired. It is usually preferred for crackers, pretzels and sauerkraut.

There are several grades of solar salt. The crude grade is commonly used for salting fish and curing meat. This grade and the next, which is ground and sized, are used for such industrial purposes as softening water, manufacturing chemicals, freezing ice cream, curing hides, etc. Refined salt, which is about one-third of the total amount, is made by dissolving and refining solar salt. Then it is sold for table and household use and food preparation etc. Solar salt is manufactured by different processes:

(1) The oriental leaching process; (2) The oriental solar process, in which no attempt is made to separate impurities from the salt; (3) The improved oriental solar process, in which sediment, calcium carbonate, iron oxide and calcium sulphate are separated by preliminary evaporation of the sea-water in concentration ponds; (4) The European solar process, in which the sediment, iron sulphide, calcium carbonate and calcium sulphate are separated from the brine by preliminary evaporation of the sea-water and the greater proportion of the chlorides of calcium and magnesium are removed by withdrawing the mother liquor from the crystallizing ponds when these salts begin to separate; (5) The Norwegian process, in which sea-water is concentrated by freezing and salt is recovered by the evaporation of the concentrated brine.

Vacuum salt is manufactured under the Alsberger salt refining system but is recrystallized in vacuum pans. Details about this process have already been given in the Technology chapter.

The different grades of refined salt are:—

Mill salt (two types), Coarse granulated, Fine granulated, Baker's fine, Shaker salt. Different grades are used for different purposes.

For commercial salt there are 10 principal market areas, all of which, except Oklahoma, have long been recognised as natural self-marketing territory. These areas (except Oklahoma, whose out-put cannot be disclosed separately) correspond roughly to the chief producing States as reported by the Bureau of Mines. The Centres are:—

New York, Ohio, Michigan, Michigan-Kansas, Kansas, Oklahoma, Texas, Utah, California, and Louisiana.

ARGENTINA

(a) *Production*.—Argentina produces two kinds of salt—common salt and rock salt. The annual average production of the common salt is 408,600 tons and that of rock salt 14,850 tons. The figures of production for the last 5 years from 1950 to 1954 are given below:—

Year	Salt Common	Salt Rock
1950	291,945	799
1951	416,890	608
1952	480,530	1,100
1953	296,239	1,200 (estimated)
1954	543,947	1,370

(b) *Imports*.—The salt is consumed in the country and is also exported. The average export comes to about 22,000 tons per annum. The figures of exports from 1950 to 1954 are given below:—

Year	Quantity of salt exported.
1950	19,988
1951	20,280
1952	17,599
1953	9,124
1954	23,809

(c) *Sales and Controls*.—Salt in Argentina is sold loose as well as in cans. The common salt in its two forms, fine and thick, is exempt from the payment of Sales Tax. There is a quality control on edible salt which is governed by the Food Regulations approved by Decree No. 141/953 issued by the Argentina Ministry of Health and the price-ceiling is also controlled.

CHINA

Salt in China is obtained both by solar evaporation and by mining. The important solar salt works are situated in the Provinces of Liaoning, Hopei, Shantung, Kiangsu, Chekiang, Fukien, Kwangtung, Kwangsi and Tzekung in South Szechwan Province, where brine is obtained from the sea, river and wells. There are salt lakes also in Inner Mongolia and the provinces of Kansu, Chinghai, Shansi, etc. where salt is manufactured from the lake brine. Salt mines are located in the provinces of Sinkiang and Yunnan where there are large deposits but owing to poor communication facilities, the output is small. The salt mined in the Yunnan province is of poor quality and has to be refined before it is sold for human consumption.

System of manufacture—

(i) *Solar Salt.*—The main method is as follows : Clay beds are constructed on the coast with channels to take in sea-water at high tide, which is evaporated by the heat of the sun in the evaporating ponds to make brine. The saturated brine is then run into the crystallizing ponds where salt is crystallised.

According to the different methods of the construction of the crystallizing ponds, the manufacturing of solar salt is classified as clay-pond process, wooden-pan process, clay-pond paved with plates of broken jar process and the sand-filter process.

(ii) *Salt Wells.*—Deep wells are dug on the surface of the ground and salt is made by evaporating the brine drawn up in open pans by boiling.

The deposit of underground salt may be rock salt or natural brine. The former is dissolved with fresh water and drawn out for evaporation.

(iii) *Salt Mines.*—The crude rock salt mixed with earth in Yunnan Province is dissolved with natural diluted brine and evaporated in open pans by boiling, but that mined in the District of Sinkiang is of high grade and is ready for edible purposes.

Production—

China produces about 55,00,000 metric tons of salt but they have a target of 75,44,000 metric tons to achieve by 1957 when they complete their First Five Year Plan.

Sale of Salt—

The marketing operations are managed by local regions. In provinces where salt is both produced and sold, there is an office for the production, transportation and sale of salt. Where there is no production the office functions only for the management of sale of salt. The wholesale transactions are mainly conducted by Government and the retail sales are managed by co-operatives. The joint State-private enterprises or private merchants and peddlers purchase salt by wholesale from the State-owned enterprises or from supply and marketing co-operatives and sell at retail or act as agents of the State-owned enterprises. The export of salt is regulated by the Ministry of Foreign Trade.

Byproducts—

The following byproducts are recovered from salt : Potassium chloride, Bromine, Borax, Boric acid, Raw Magnesium chloride, Sodium sulphate and Sodium sulphide.

NEW ZEALAND

There was no manufacture of salt in New Zealand till 1942. During the World War II, however, when the Japanese dominated the Pacific Ocean and the imports of salt into New Zealand were interfered with, New Zealand started manufacturing salt by solar evaporation from the brine of Lake Grassmere in Blenheim. The area around Lake Grassmere is surrounded by low hills covering the total water-shed including Lake Grassmere of 15,000 acres. Lake Grassmere has an area of about 3,700 acres, is quite flat

and free from channels. It was the Latex Rubber Co. Ltd., which commenced the manufacture of salt in New Zealand in 1943 as they needed the supplies for the manufacture of Caustic Soda. The salt in New Zealand is chiefly used as basis for Caustic Soda, which in its turn, is very much in demand for the soap industry, reclaiming of rubber and production of rayon, cellulose of soda ash and for many other purposes.

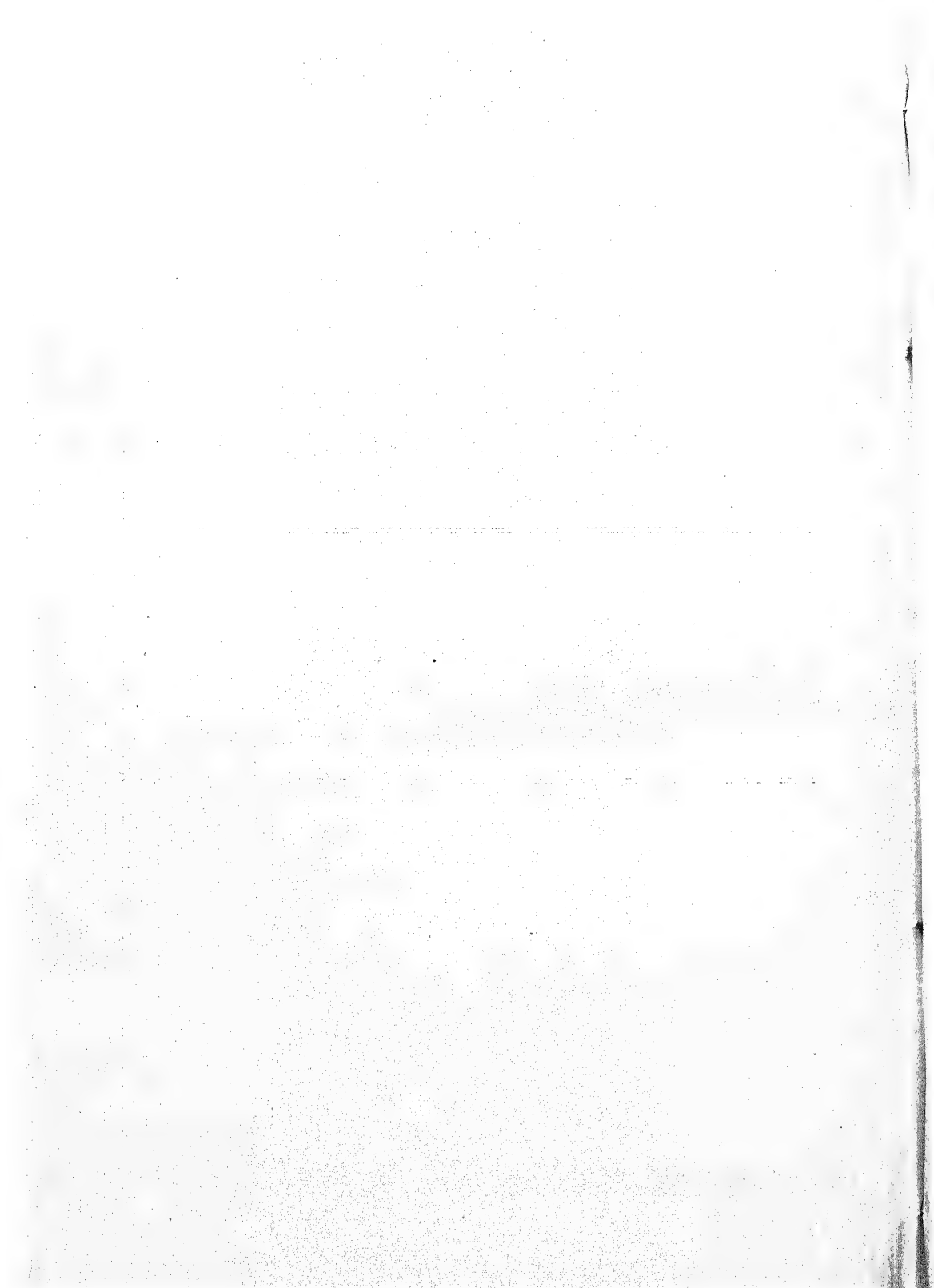
Before 1942, New Zealand used to import about 50,000 tons of salt from United Kingdom, Canada and Australia annually. The consumption of salt in New Zealand is about 50,000 tons out of which about 40,000 (4/5th) are used for industrial purposes and the balance 10,000 tons for human consumption.

The site chosen for the manufacture of salt in New Zealand, i.e. the Lake Grassmere is very favourable from the salt manufacture point of view. There is a lot of wind from all directions and very scanty rainfall. A comparison between the Meteorological data of Geelong salt works in Australia and Blenheim area of New Zealand where Lake Grassmere is situated is given below:—

	Geelong	Blenheim
Mean Annual Rainfall	20.45 in.	23.05 in.
Mean Annual Temperature	58° F.	55° F.
Mean Annual Humidity	71	67

It will be noted that while rainfall and temperature are slightly less favourable at Blenheim, Humidity is more favourable and the conditions at the Lake are still much better than at Blenheim because there is more wind and less rainfall as mentioned above. The evaporation figures show that the rate of evaporation is twice as much as the rainfall.

APPENDICES



APPENDIX No. I

Firman by the Emperor Aurangzeb (1669-1670)

“Translation of a Firman or Royal Mandate in Persian”.

IN THE NAME OF THE MOST HIGH AND HOLY GOD

The exalted Firman of the Emperor ABDUL MUZUFFAR
MOHAMMAD MOHEDDIN ALAMGIR the Conqueror.

(SEAL)

Whereas there has come before the holy and glorious sight (of his Majesty) a petition from the possessor of generosity and excellence the servant (Khanazad) who is worthy of rewards and favours, the “Nazim” (or Governor) of the Subah of Ahmedabad dependent on Goojerat, (representing that the Mahal or district) of Mohammad Nagar, otherwise named Halud, containing one hundred and twelve villages, together with the salt pits, the revenue (of which is) Dams twenty five lacs and eight thousand Dams, was entirely assigned in accordance with the sanads of the former Rulers in Jagir to the ancestors of the Zamindar Rajput Jhala (namely), Jaswantsing (and his descendants) generation after generation without (fear of) obstruction (on the part) of (any) person and (without) the imposition of any condition and (or) conditions, and without (any) partnership with any other (person) and (as) up to this period the abovenamed Zamindar is the possessor and occupier (of the same) and (as) at this time (it is represented) that the abovementioned Mahal, together with the villages and the salt pits, was assigned in Jagir to Nazar Ali Khan by the Court of His Majesty and the Ruler of the World and (as) he (Nazar Ali Khan) receives every year the sum of twenty five thousand Rupees by virtue of holding the Jagir, and (as) the abovenamed (Jaswantsing) expects that by the grace and favour of the Emperor (the claim for) the abovementioned sum, may be rendered void the order of His Majesty, which must be acted upon, has attained the honour of manifestation as follows:—

In accordance with the representation of the Nazim of the Subah the “Mahal”, together with the villages and the abovementioned salt pits, are to be recognized as having been given and delivered over the Jagir to the abovementioned Zamindar (and his descendants) generation after generation according to the ancient custom, without the partnership of any other person, and without (fear of) obstruction (in the part) of any condition and (or) conditions, (and the claim for) the abovementioned amount is to be considered as rendered void (Jaswantsing being free from responsibility for the same) in order that (he) the former expending the revenues thereof for his own (use), may perform as much as possible, the duties of well-wisher and (of taking) care (of the villages, &c) and the duties of loyalty and watchfulness. And he shall take care and keep the roads safe from (perpetration of) highway robbery. And he shall make an arrangement with regard to the rules and regulations of that place (in order) that all the subjects and the whole population may remain in safety and peace. It is necessary that the present and future Governors and Officers and Accountants and Jagirdars considering the abovementioned Mahal together with the abovementioned villages and the abovementioned salt pits as given to and confirmed in the possession and control of the former Jagirdar with his children and dependents, generation after generation,

shall not demand Nazar Ali Khan's sum. And all suits with regard to dealings (i.e. civil suits) and assaulting and beating (i.e. criminal matters) and other (matters) being referred to him (Jaswantsing, said officers, &c.) shall refrain from collecting the revenue (from him). And they shall consider the Zamindar Rajput as the independent Jagirdar of that place without (his being in) partnership with any other person. And they shall neither change nor alter the same by any manner or means. And understanding that all demands of the Emperor and civil impositions are remitted and cancelled, they shall neither obstruct nor annoy him with regard to (demand payment of) the revenue received from the land (Malwajhat) and expenses (Akh-rajat) and in respect of all the old and new customary payments and allowances, and shall not interfere (with him) in any way. And they are to consider the abovementioned Jagirdar as possessing full authority (Mookhtar-e-kul). In this matter they are not every year to ask for a new Sanad or Parvanah. And should (any persons) at any other place have (any other writings etc.) they (the said officers, &c.) shall not rely (on the same). Written on the fifteenth day of Shawal, in the twenty-fourth year of His Majesty's reign."

APPENDIX No. II

The Sambhar Lake was leased from the Jaipur and Jodhpur Darbars. The following Treaties were entered into with the Darbars:

JAIPUR.

Treaty between the British Government and His Highness S. RAM SINGH, Maharaja of Jaipur, G.C.S.I., his heirs and successors, executed on the one part by Major WILLIAM H. BEYNON, Political Agent at the Court of Jaipur, under authority from Lieutenant-Colonel RICHARD HARTE KEATINGS, C.S.I. and V.C., Agent to the Governor General for the States of Rajputana, in virtue of the full powers vested in him by His Excellency the Right Hon'ble RICHARD SOUTHWELL BOURKE, Earl of Mayo, Viscount Mayo of Monycrower, Baron Naas of Naas, K.P., G.M.S.I., P.C. &c., &c., Viceroy and Governor General of India, and on the other part by Nawab Mohammed Faiz Ali Khan, Bahadur, in virtue of the full powers conferred on him by Maharaja RAM SINGH, aforesaid.

I. Subject to the conditions contained in the following Agreement, the Government of Jaipur will lease to the British Government its right of manufacturing and of selling salt within the limits of the territory bordering on the Sambhar Lake, as hereinafter defined in Article IV, and of levying duties on salt produced within such limits.

II. This lease shall continue in force until such time as the British Government desires to relinquish it, provided that the British Government shall give notice to the Government of Jaipur of its intention to terminate the arrangement two full years previous to the date on which it desires the lease to cease.

III. To enable the British Government to carry on the manufacture and sale of salt at the Sambhar Lake, the Jaipur Government shall empower the British Government and all officers appointed by the British Government for such purposes to enter and search, in case of suspicion, houses and all other places enclosed or otherwise within the limits hereinafter defined, and to arrest and punish with fine, imprisonment, confiscation of goods, or otherwise, any and all persons detected within such limits in the violation of any of the rules or regulations which may be laid down by the British Government in regard to the manufacture, sale, or removal of salt, or the prevention of unlicensed manufacture or smuggling.

IV. The strip of territory bordering on the shores of the Lake, including the town of Sambhar and twelve other hamlets, and comprehending the whole of the territory now subject to the joint jurisdiction of the States of Jaipur and Jodhpur, shall be demarcated, and the whole space enclosed by such line of demarcation as well as such portions of the Lake itself or of its dry bed as are now under the said joint jurisdiction, shall be held to constitute the limits within which the British Government and its officers are authorised to exercise the jurisdiction referred to in Article III.

V. Within the said limits, and so far as such measures may be necessary for the protection or furtherance of the manufacture, sale, or removal of salt the prevention of smuggling and the enforcement of the rules laid down in accordance with Article III of this Agreement, the British Government, or the officers by it empowered, shall be authorised to occupy land for building or other purposes, to construct roads, erect barriers, hedges, or buildings, and to remove buildings or other property. If any land paying land revenue to the Government of Jaipur be occupied under the authority of the British Government for any of the purposes aforesaid, the British Government shall pay to the Government of Jaipur an annual rent equal to the amount of such revenue. In every case in which anything involving injury to private property shall be done by the British Government or its officers under this Article, one month's previous notice shall be given to the Government of Jaipur and in all such cases proper compensation shall be paid by the British Government on account of such injury. In case of difference between the British Government, or its officers and the owner of such property as to the amount of compensation, such amount shall be determined by arbitration. The erection of any buildings within the said limits shall not confer on the British Government any proprietary right in the land, which, on the termination of the lease, shall revert to the Government of Jaipur with all building or materials left thereon by the British Government. No temples or places of religious worship shall be interfered with.

VI. Under the authority of the Jaipur Government, the British Government shall constitute a Court, presided over by a competent officer, who shall usually hold his sittings within the above mentioned limits for the trial and punishment, on conviction, of all persons charged with violations of the rules and regulations referred to in Article III, or offences connected therewith; and the British Government is authorised to cause the confinement of any such offenders sentenced to imprisonment either within the aforesaid limits or within its own territories as may seem to it most fitting.

VII. From and after the date of the commencement of the lease, the British Government will from time to time fix the price at which salt manufactured within the said limits other than the salt to be delivered under the second clause of this Article, shall be offered for sale. The Jaipur Government shall be entitled to receive annually at the place of manufacture from the British Government, for the consumption of the Jaipur State, any quantity of salt which the Jaipur Government may demand not exceeding one hundred and seventytwo thousand (172,000) British Indian maunds, paying for the same at the rate of nine (9) annas (British Currency) per maund. The Jaipur Government will be at liberty to sell such salt at any price that it may fix.

VIII. Of the stocks of salt owned jointly by the Governments of Jaipur and Jodhpur, and existing within the said limits at the commencement of the lease, the share belonging to the Jaipur Government being the half of the stocks above mentioned shall be transferred by the said Government to the British Government on the following terms:—In accordance with custom, the Government of Jaipur will transfer its share in five hundred and ten thousand (510,000) British Indian maunds of salt to the British Government free of cost. The price to be paid for the share of the Jaipur Government in the remainder of the said stock shall be reckoned at six and a half annas ($6\frac{1}{2}$) per British Indian maund, and payment shall be made at this rate by the British Government to the Government of Jaipur, provided that the said payment of six and a half annas per maund to the Government

of Jaipur shall only commence when salt in excess of eight hundred and twenty-five thousand (825,000) British Indian maunds is sold or exported by the British Government in any year, and then only on the share of such excess which belongs to the Government of Jaipur; and until the aggregate of such yearly excesses amounts to the full quantity of the stocks of salt transferred over and above the said five hundred and ten thousand British Indian maunds, the British Government shall not pay the royalty of 20 per cent on the sale price of such excess, as provided in Article XII. In reckoning the said eight hundred and twenty-five thousand maunds, the amount of salt reserved for the consumption of the Jaipur State under Clause 2 of Article VII shall be included.

IX. No tax, toll, transit duty, or due of any kind whatsoever, shall be levied by the Jaipur Government, or shall by it be permitted to be levied by any other person, on any salt manufactured or sold by the British Government within the said limits, or while in transit through the Jaipur territory and covered by a British pass, *en route* to any place outside the Jaipur territory, provided that on all salt delivered under Article VII, or sold for consumption within the territory of Jaipur, the Government of that State will be at liberty, to levy whatever tax it may please.

X. Nothing in this Agreement shall be held to bar the sovereign jurisdiction of the Jaipur Government within the aforesaid limits, in all matters, civil and criminal, not connected with the manufacture, sale, or removal of salt, or the prevention of unlicensed manufacture or smuggling.

XI. The Government of Jaipur shall be relieved of all expenses whatsoever connected with the manufacture, sale, and removal of salt, and the prevention of unlicensed manufacture, or smuggling within the limits aforesaid; and, in consideration of the lease granted to it, the British Government agrees to pay to the Jaipur Government, in two half-yearly instalments, an annual rent of one hundred and twenty-five thousand (125,000) Rupees, British Currency, on account of the share of the Jaipur Government in the salt sold within the said limit, and one hundred and fifty thousand (150,000) rupees, British Currency, in compensation for duties on salt now levied by the Jaipur Government and surrendered under the present Agreement; and the total sum of such annual rent, amounting to two hundred and seventy-five thousand (275,000) rupees, British Currency, shall be paid without reference to the quantity of salt actually sold in, or exported from, the said limits.

XII. If the amount of salt sold in, or exported from, the said limits by the British Government in any year shall exceed eight hundred and twenty five thousand (825,000)* British Indian maunds, the British Government shall pay to the Government of Jaipur on all such excess (subsequent to the exhaustion of the stock referred to in Article (VIII) a royalty at the rate of 20 per cent on the price per maund, which shall have been fixed as the selling price under the first Clause of Article VII. In the event of any doubts arising as to the amount of salt on which royalty is claimable in any year, the accounts rendered by the principal British Officer in charge at Sambhar shall be deemed conclusive evidence of the amounts actually sold or exported by the British Government within the periods to which they refer provided that the Jaipur Government shall not be debarred from deputing one of its own officers to keep a record of sales for its own satisfaction.

*Modified *Vide* letter from the Government of India, Foreign Department. No. 3631 I., dated 26th September 1884.

XIII. The British Government agrees to deliver annually (7,000) seven thousand British Indian maunds of good salt, free of all charges, for the use of the Jaipur Darbar, such salt to be delivered at the place of manufacture to any officer empowered by the Jaipur Government to receive it.

XIV. The British Government shall have no claim on the land or other revenue, unconnected with salt, payable from the town of Sambhar, or other villages or lands included within the limits aforesaid.

XV. The British Government shall not sell any salt outside the limits aforesaid within the Jaipur territory.

XVI. If any person employed by the British Government, within the said limits shall have absconded after committing an offence, or if any person shall have absconded after committing a breach of the Rules laid down under Article III, the Jaipur Government shall, on sufficient evidence of his criminality, make every effort to cause his arrest and surrender to the British authorities within the said limits, in case of his passing through, or taking refuge in, any part of the Jaipur territories.

XVII. None of the conditions of this Agreement shall have effect until the British Government shall actually assume charge of the manufacture of salt within the said limits. The British Government may determine the date of so assuming charge, provided that such date shall be one of the dates following, *viz.*, the 1st November 1869, the 1st May or the 1st November 1870, or the 1st May 1871. If such charge be not assumed on or before the 1st May 1871, the conditions of this Agreement shall be null and void.

XVIII. None of the conditions contained in this Agreement shall be in any way set aside or modified without the previous consent of both Governments; and should either party fail or neglect to adhere to these conditions, the other party shall cease to be bound by this Agreement.

(Sd.) W.H. BEYNON,

Political Agent.

(Sd.) NAWAB MOHAMED FAIZ ALI, KHAN BAHADUR.

Signed, sealed, and exchanged at Simla on the seventh day of August in the year of our Lord one thousand eight hundred and sixty-nine.

(Sd.) S. RAM SINGH.

(Sd.) MAYO.

This Treaty was ratified by His Excellency the Viceroy and Governor General of India, at Simla on the seventh of August 1869.

(Sd.) W.S. SETON-KARR,

Secy. to the Govt. of India, Foreign Deptt.

JODHPUR.

Treaty between the BRITISH GOVERNMENT and HIS HIGHNESS MAHARAJA TUKHT SINGH, G.C.S.I., of Jodhpur, his heirs and successors, executed on the one part by COLONEL JOHN C. BROOKE, Officiating Political Agent at the Court of Jodhpur, under authority from LIEUTENANT-COLONEL RICHARD HARTE KEATINGE, C.S.I., and V. C., Agent to the Governor General for the States of Rajputana, in virtue of the full powers vested in him by HIS EXCELLENCY THE RIGHT HON'BLE RICHARD SOUTHWELL BOURKE, Earl of Mayo, Viscount Mayo of Monycrower, Baron Naas of Naas, K. P., G.M.S.I., P.C., &c., &c., Viceroy and Governor General of India, and on the other part by JOSHEE HANSRAJ, Musahib of Marwar, in virtue of the full powers conferred on him by MAHARAJA TUKHT SINGH, aforesaid.

I. Subject to the conditions contained in the following Agreement, the Government of Jodhpur will lease to the British Government its right of manufacturing and of selling salt within the limits of the territory bordering on the Sambhar Lake, as hereinafter defined in Article IV, and of levying duties on salt produced within such limits.

II. This lease shall continue in force until such time as the British Government desires to relinquish it, provided that the British Government shall give notice to the Government of Jodhpur of its intention to terminate the arrangement two full years previous to the date on which it desires the lease to cease.

III. To enable the British Government to carry on the manufacture and sale of salt at the Sambhar Lake, the Jodhpur Government shall empower the British Government, and all officers appointed by the British Government for such purposes, to enter and search, in case of suspicion, houses and all other places enclosed or otherwise within the limits hereinafter defined, and to arrest and punish with fine, imprisonment, confiscation of goods, or otherwise, any and all persons detected within such limits in the violation of any of the rules or regulations which may be laid down by the British Government in regard to the manufacture, sale, or removal of salt, or the prevention of unlicensed manufacture or smuggling.

IV. The strip of territory bordering on the shores of the Lake, including the town of Sambhar and twelve other hamlets, and comprehending the whole of the territory now subject to the joint jurisdiction of the States of Jodhpur and Jaipur, shall be demarcated and the whole space enclosed by such line of demarcation, as well as such portions of the Lake itself, or of its dry bed, as are now under the said joint jurisdiction, shall be held to constitute the limits within which the British Government and its officers are authorised to exercise the jurisdiction referred to in Article III.

V. Within the said limits, and so far as such measures may be necessary for the protection or furtherance of the manufacture, sale, or removal of salt, the prevention of smuggling, and the enforcement of the rules laid down in accordance with Article III of this Agreement, the British Government, or the officers by it empowered shall be authorized to occupy land for building or other purposes, to construct roads, erect barriers, hedges, or buildings, and to remove buildings or other property.

If any land paying land revenue to the Government of Jodhpur be occupied under the authority of the British Government for any of the purposes aforesaid, the British Government shall pay to the Government of Jodhpur an annual rent equal to the amount of such revenue.

In every case in which anything involving injury to private property shall be done by the British Government or its officers under this Article, one months' previous notice shall be given to the Government of Jodhpur, and in all such cases proper compensation shall be paid by the British Government on account of such injury. In case of difference between the British Government or its officers and the owner of such property as to the amount of the compensation, such amount shall be determined by arbitration.

The erection of any buildings within the said limits shall not confer on the British Government any proprietary right in the land, which, on the termination of the lease shall revert to the Government of Jodhpur, with all buildings or materials left thereon by the British Government. No temples or places of religious worship shall be interfered with.

VI. Under the authority of the Jodhpur Government, the British Government shall constitute a Court, presided over by a competent officer, who shall usually hold his sittings within the above-mentioned limits, for the trial and punishment, on conviction, of all persons charged with violations of the rules and regulations referred to in Article III, or offences connected therewith; and the British Government is authorised to cause the confinement of any such offenders sentenced to imprisonment either within the aforesaid limits or within its own territories, as may seem to it most fitting.

VII. From and after the date of the commencement of the lease, the British Government will, from time to time, fix the price at which salt manufactured within the said limits, and intended for exportation beyond the limits of the Jodhpur and Jaipur States, shall be offered for sale.

VIII. Of the stocks of salt owned jointly by the Governments of Jodhpur and Jaipur, and existing within the said limits at the commencement of the lease, the share belonging to the Jodhpur Government, being the half of the stocks above mentioned, shall be transferred by the said Government to the British Government on the following terms:—

The Jodhpur Government will transfer its share in five hundred and ten thousand (510,000) British Indian maunds of salt to the British Government free of cost. The price to be paid for the share of the Jodhpur Government in the remainder of the said stocks shall be reckoned at six and a half annas ($6\frac{1}{2}$) per British Indian maund, and payment shall be made at this rate by the British Government to the Government of Jodhpur, provided that the said payment of six and a half annas per maund to the Government of Jodhpur shall only commence when salt in excess of eight hundred and twenty-five thousand (825,000) British Indian maunds is sold or exported by the British Government in any year, and then only on the share of such excess which belongs to the Government of Jodhpur; and until the aggregate of such yearly excesses amounts to the full quantity of the stocks of salt transferred over and above the said five hundred and ten thousand (510,000) British Indian maunds, the British Government shall not pay the royalty of 20 per cent on the sale price of such excess, as provided in Article XII.

IX. No tax, toll, transit duty, or due of any kind whatsoever, shall be levied by the Jodhpur Government, or shall by it be permitted to be levied by any other person, on any salt manufactured or sold by the British Government within the said limits, or while in transit through the Jodhpur territory, and covered by a British pass, *en route* to any place outside the Jodhpur territory.

X. Nothing in this Agreement shall be held to bar the sovereign jurisdiction of the Jodhpur Government within the aforesaid limits, in all matters, civil and criminal, not connected with the manufacture, sale, or removal of salt, or the prevention of unlicensed manufacture or smuggling.

XI. The Government of Jodhpur shall be relieved of all expenses whatever connected with the manufacture, sale, and removal of salt, and the prevention of unlicensed manufacture, or smuggling within the limits aforesaid; and, in consideration of the lease granted to it, the British Government agrees to pay to the Jodhpur Government, in two half-yearly instalments, an annual rent of one hundred and twenty-five thousand (125,000) rupees, British Currency, on account of the share of the Jodhpur Government in the salt sold within the said limits, and the total sum of such annual rent, amounting to one hundred and twenty-five thousand (125,000) rupees, British Currency, shall be paid without reference to the quantity of salt actually sold in, or exported from, the said limits.

XII. If the amount of salt sold in, or exported from, the said limits by the British Government in any year shall exceed* eight hundred and twenty-five thousand (825,000) British Indian maunds, the British Government shall pay to the Government of Jodhpur on all such excess (subsequent to the exhaustion of the stock referred to in Article VIII) a royalty at the rate of 20 per cent on the price per maund, which shall have been fixed as the selling price under the first clause of Article VII.

In the event of any doubts arising as to the amount of salt on which royalty is claimable in any year, the accounts rendered by the principal British Officer in charge at Sambhar shall be deemed conclusive evidence of the amounts actually sold or exported by the British Government within the periods to which they refer, provided that the Jodhpur Government shall not be debarred from deputing one of its own officers to keep a record of sales for its own satisfaction.

XIII. The British Government agrees to deliver annually seven thousand (7,000) British Indian maunds of good salt, free of all charges, for the use of the Jodhpur Darbar; such salt to be delivered at the place of manufacture to any officer empowered by the Jodhpur Government to receive it.

XIV. The British Government shall have no claim on the land or other revenue, unconnected with salt, payable from the town of Sambhar or other villages or lands included within the limits aforesaid.

XV. The British Government shall not sell salt within the Jodhpur territory outside the limits of such jurisdiction as may be assigned to it by this or any other Agreement.

XVI. If any person employed by the British Government within the limits shall have absconded after committing an offence, or if any person shall have absconded after committing a breach of the rules laid

* Modified *Vide* letter from the Government of India, Foreign Department No. 3632-I, dated 26th September 1884.

down under Article III, the Jodhpur Government shall, on sufficient evidence of criminality, make every effort to cause his arrest and surrender to the British authorities within the said limits, in case of his passing through, or taking refuge in, any part of the Jodhpur territories.

XVII. None of the conditions of this Agreement shall have effect until the British Government shall actually assume charge of the manufacture of salt within the said limits.

The British Government may determine the date of so assuming charge, provided that if such charge be not assumed on or before the 1st May 1871, the conditions of this Agreement shall be null and void.

XVIII. None of the conditions contained in this Agreement shall be in any way set aside or modified without the previous consent of both Governments, and should either party fail or neglect to adhere to these conditions, the other party shall cease to be bound by this Agreement.

Signed, sealed, and exchanged at Jodhpur this twenty-seventh day of January, A. D. eighteen hundred and seventy, corresponding to the eleventh day of Mahabud, Samvat nineteen hundred and twenty-six.

(Sd.) J. C. BROOKE, Colonel,

Officiating Political Agent, Marwar.

Persian Seal

Jodhpur Agency Office

Official seal of State of Jodhpur.

(Sd.) JOSHEE HANSRAJ.

(In native characters.)

(Sd.) MAYO.

Government Seal.

H.E.'s SEAL.

This Treaty was ratified by His Excellency the Viceroy and Governor General of India, at Fort Williams, on the fifteenth of February 1870.

Seal

(Sd.) C. U. AITCHISON,

Offg. Secy. to the Govt. of India, Foreign Dept.

SAMBHAR LAKE TREATY (NAWA-GUDHA, &c.)

JODHPUR

Treaty between the BRITISH GOVERNMENT and HIS HIGHNESS TUKHT SINGH, G.C.S.I., Maharaja of Jodhpur, his heirs and successors, executed on the one part by COLONEL JOHN CHEAP BROOKE, Officiating Political Agent at the Court of Jodhpur, under authority from LIEUTENANT-COLONEL RICHARD HARTE KEATINGE, C.S.I., and V.C., Agent to the Governor General for the States of Rajputana, in virtue of the full powers vested in him by HIS EXCELLENCY THE RIGHT HON'BLE RICHARD SOUTHWELL BURKE, Earl of Mayo, Viscount Mayo of Monycrower, Baron Naas of Naas, K.P., G.M.S.I., P.C., &c. &c., Viceroy and Governor General of India, and on the other part by JOSHEE HANSRAJ, Musahib of Marwar, in virtue of the full powers conferred on him by MAHARAJA TUKHT SINGH, aforesaid.

I. Subject to the conditions contained in the following Agreement, the Government of Jodhpur will lease to the British Government its right of manufacturing and of selling salt within the limits of the territory bordering on the Sambhar Lake, as hereinafter defined in Article IV, and of levying duties on salt produced within such limits.

II. This lease shall continue in force until such time as the British Government desires to relinquish it, provided that the British Government shall give notice to the Government of Jodhpur of its intention to terminate the arrangement two full years previous to the date on which it desires the lease to cease.

III. To enable the British Government to carry on the manufacture and sale of salt at the Sambhar Lake, the Jodhpur Government shall empower the British Government, and all Officers appointed by the British Government for such purposes, to enter and search, in case of suspicion, houses and all other places, enclosed or otherwise, within the limits hereafter defined, and to arrest and punish with fine, imprisonment, confiscation of goods or otherwise, any and all persons detected within such limits in the violations of any of the rules or regulations which may be laid down by the British Government in regard to the manufacture, sale, or removal of salt, or the prevention of unlicensed manufacture or smuggling.

IV. A strip of territory, bordering the shores of the Lake throughout, within the separate jurisdiction of Jodhpur, including Nawa, Gudha, and other villages and hamlets, and averaging two (2) miles in width measured from the high water limits of the Lake, shall be demarcated, and the whole space enclosed by such line of demarcation, as well as such portions of the Lake itself or of its dry bed as are now under the exclusive and separate jurisdiction of Jodhpur, shall be held to constitute the limits within which the British Government and its officers are authorized to exercise the jurisdiction referred to in Article III.

V. Within the said limits, and so far as such measures may be necessary for the protection or furtherance of the manufacture, sale or removal of salt, the prevention of smuggling, and the enforcement of the rules laid down in accordance with Article III of this Agreement, the British Government, or the officers by it empowered, shall be authorised to occupy land for building or other purposes, to construct roads, erect barriers, hedges, or buildings, and to remove buildings or other property.

If any land paying land revenue to the Government of Jodhpur be occupied under the authority of the British Government for any of the purposes aforesaid, the British Government shall pay to the Government of Jodhpur an annual rent equal to the amount of such revenue.

In every case in which anything involving injury to private property shall be done by the British Government or its officers under this Article, one month's previous notice shall be given to the Government of Jodhpur, and in all such cases proper compensation shall be paid by the British Government on account of such injury. In case of difference between the British Government or its officers and the owner of such property as to the amount of the compensation, such amount shall be determined by arbitration.

The erection of any buildings within the said limits shall not confer on the British Government any proprietary right in the land, which on the termination of the lease shall revert to the Government of Jodhpur, with all buildings or materials left thereon by the British Government.

No temples or places of religious worship shall be interfered with.

VI. Under the authority of the Jodhpur Government, the British Government shall constitute a Court, presided over by a competent officer, for the trial and punishment, on conviction, of all persons charged with violations of the rules and regulations referred to in Article III, or offences connected therewith; and the British Government is authorised to cause the confinement of any such offenders sentenced to imprisonment within the aforesaid limits or elsewhere as may seem to it most fitting.

VII. From and after the date of the commencement of the lease, the British Government will, from time to time, fix the price at which salt manufactured within the said limits shall be offered for sale.

VIII. The whole of the stocks of salt existing within the aforesaid limits at the commencement of the lease shall be transferred by the Jodhpur Government to the British Government on the following terms:—

The Government of Jodhpur will transfer six hundred thousand (600,000) British Indian maunds of salt to the British Government as stock with which to commence operations free of cost. The price to be paid to the Jodhpur Government for the remainder of the said stock shall be reckoned at six and a half annas ($6\frac{1}{2}$) per British Indian maund, and payment shall be made at this rate by the British Government to the Government of Jodhpur: provided that the said payment of six and half annas ($6\frac{1}{2}$) per maund to the Government of Jodhpur shall only commence when salt in excess of nine hundred thousand (900,000) British Indian maunds is sold or exported by the British Government in any year, and until the aggregate of such yearly excesses amounts to the full quantity of the stock of salt transferred, over and above the said six hundred thousand (600,000) British maunds, the British Government shall not pay the royalty of forty (40) per cent on the sale price of such excess as provided in Article XII.

IX. No tax, toll, transit duty, or due of any kind whatsoever shall be levied by the Jodhpur Government, or shall by it be permitted to be levied by any other person, on any salt manufactured or sold by the British Government within the said limits, or while in transit through the Jodhpur territory, and covered by a British pass, *en route* to any place outside the Jodhpur territory; provided that on all salt sold for consumption within the territory of Jodhpur, the Government of that State will be at liberty to levy whatever tax it may please.

X. Nothing in this Agreement shall be held to bar the sovereign jurisdiction of the Jodhpur Government within the aforesaid limits in all matters, civil and criminal, not connected with the manufacture, sale or removal of salt, or the prevention of unlicensed manufacture or smuggling.

XI. The Government of Jodhpur shall be relieved of all expenses, whatsoever, connected with the manufacture, sale, and removal of salt and the prevention of unlicensed manufacture or smuggling within the limits aforesaid, and in consideration of the lease and other immunities hereby granted to it, the British Government agrees to pay to the Jodhpur Government, in two half-yearly instalments, an annual rent of three lakhs (3,00,000) of rupees, British Currency, and the total sum of such annual rent, amounting to three lakhs (3,00,000) of rupees, British Currency shall be paid without reference to the quantity of salt actually sold in, or exported from the said limits. The above sum of three lakhs (3,00,000) of rupees shall include all rights of *bhoom*, transit dues, and *huqs* of every kind due to the Thakoor of Koochawan and others which the Jodhpur Government agrees to satisfy.

XII. If the amount of salt sold in, or exported from, the said limits* by the British Government in any year shall exceed nine hundred thousand (900,000) British Indian maunds, the British Government shall pay to the Government of Jodhpur on all such excess (subsequent to the exhaustion of the stock referred to in Article VIII) a royalty at the rate of forty (40) per cent on the price per maund, which shall have been fixed as the selling price under Article VII.

In the event of any doubts arising as to the amount of salt on which royalty is claimable in any year, the accounts rendered by the principal British Officer in charge at Sambhar shall be deemed conclusive evidence of the amounts actually sold or exported by the British Government within the periods to which they refer, provided that the Jodhpur Government shall not be debarred from deputing one of its own officers to keep a record of sales for its own satisfaction.

XIII. The British Government agrees to deliver annually seven thousand (7,000) British Indian maunds of good salt, free of all charges, for the use of the Jodhpur Darbar; such salt to be delivered at the place of manufacture to any officer empowered by the Jodhpur Government to receive it.

XIV. The British Government shall have no claim on the land or other revenue, unconnected with salt, payable from the townships of Nawa, Gudha, or other villages or lands included within the limits aforesaid.

XV. The British Government shall not sell any salt within the Jodhpur territory outside the limits of such jurisdiction as may be assigned to it by this or any other Agreement.

XVI. If any person employed by the British Government within the said limits shall have absconded after committing an offence, or if any person shall have absconded after committing a breach of the rules laid down under Article III, the Jodhpur Government shall, on sufficient evidence of his criminality, make every effort to cause his arrest and surrender to the British authorities within the said limits, in case of his passing through, or taking refuge in, any part of the Jodhpur territories.

* Modified Vide letter from the Government of India, Foreign Department, No 3632-I., dated 26th September 1884.

XVII. None of the conditions of this Agreement shall have effect until the British Government shall actually assume charge of the manufacture of salt within the said limits.

The British Government may determine the date of so assuming charge, provided that if such charge be not assumed on or before the first May 1871, the conditions of this Agreement shall be null and void.,

XVIII. None of the conditions contained in this Agreement shall in any way be set aside or modified without the previous consent of both Governments; and should either party fail or neglect to adhere to these conditions the other party shall cease to be bound by this Agreement.

Signed at Jodhpur on the eighteenth day of April, A.D., one thousand eight hundred and seventy.

(Sd.) J. C. BROOKE, Colonel,
Offg. Political Agent.

Seal

Seal of State of Jodhpur.

(Sd.) JOSHEE HANSRAJ.

Seal

(H.E.'s)
Seal

(Sd.) MAYO.

This Treaty was ratified by His Excellency the Viceroy and Governor General of India, at Simla, on the twenty-sixth July, 1870.

(Sd.) C. U. AITCHISON,

Offg. Secy. to the Govt. of India, Foreign
Department.

APPENDIX No. III

Indian Standard

SPECIFICATION FOR EDIBLE COMMON SALT

(Tentative)

Foreword

This tentative Indian Standard was adopted by the Indian Standards Institution on 29 November 1950 on the endorsement by the Chemical Division Council of the draft finalized on 5 September 1950 by the Heavy Chemicals (Inorganic) Sectional Committee.

Common salt is produced in India from different sources and its present annual output exceeds 20 lakh tons. Owing to the diversity of sources and variations in the practice of manufacture and storage, the quality of salt has shown undesirable variations.

A request for laying down standards for edible salt was made by the Director of Industries, Bombay. The need for standards was also felt keenly by the Salt Experts Committee, appointed by the Government of India in April 1948, who noted in the course of their visit to the salt works in India that the salt produced at present in some parts of the country was of poor quality due to a number of reasons. In the opinion of this Committee the quality of the salt could be improved easily and if some standards were laid down, it would help progressive manufacturers in improving the quality and the output of material produced by them. The Government of India also appreciated this view-point and desired that the formulation of specifications for common salt should be expedited.

In this standard requirements have been prescribed in such a manner that the clause relating to adjustment of weight due to variations of moisture content would be remunerative to manufacturers of high grade salt and at the same time accommodate the backward sections of the industry. The salt industry in the country is now at a stage at which the controlling authorities and progressive manufacturers are seriously endeavouring to improve the quality of the product and, therefore, this standard is kept tentative, to be revised after a period of two years, by which time manufacturing conditions are expected to improve.

The Salt Research Committee of the Council of Scientific and Industrial Research have collaborated enthusiastically in the technical work in connection with this standard. This assistance and the assistance derived from the existing literature on the subject supplied by the Central Board of Revenue Control Laboratory, the Council of Scientific and Industrial Research and other organizations are gratefully acknowledged.

This standard is intended chiefly to cover the technical provisions relating to the purchase of the material, and it does not include all the necessary provisions of a contract.

1. Scope

1.1 This standard prescribes the requirements and the methods of test for Edible Common Salt.

2. Sampling

2.1 Representative samples of the material shall be drawn as prescribed in Appendix A.

3. Requirements

3.1 *Description*—Edible common salt shall be a crystalline solid, white or pale pink or light grey in colour, free from visible contamination with clay, grit and other extraneous adulterants and impurities.

3.2 *Moisture Content*—Unless agreed otherwise between the purchaser and the vendor, common salt shall not contain moisture in excess of 6 per cent of the weight of the undried sample when determined according to the method prescribed in Appendix B.

Table 1.— Requirements for Edible Common Salt

(Clause 3.3)

Serial number (1)	Characteristic (2)	Requirement (3)
(i)	Sodium chloride (NaCl), per cent by weight, <i>minimum</i>	96.0
(ii)	Matter insoluble in water, per cent by weight, <i>maximum</i>	1.0
(iii)	Matter soluble in water other than sodium chloride, per cent by weight, <i>maximum</i> .	3.0

3.2.1 Whatever the moisture content of the salt delivered, the weight of salt to be credited shall be calculated according to the following formula:

$$\text{Weight of material to be credited} = \frac{W(100-M)}{94}$$

where M = per cent moisture in the material, and W = weight of material delivered.

3.3 *Composition*—The dry material shall comply with the requirements in Table I, when tested according to the methods prescribed in Appendix C.

4 Packing and Marking

4.1 The material shall be supplied in bulk or packages as agreed between the purchaser and the vendor.

4.2 The packages shall be securely closed and marked with the manufacturer's name, weight of material in the package, recognized trademark, if any, and the year of manufacture.

APPENDIX A

(Clause 2)

*Sampling of Edible Common Salt.***1. General Requirements of Sampling**

1.0 In drawing samples, the following precautions and directions shall be observed:

1.1 Samples shall not be taken in an exposed place.

1.2 The sampling instrument shall be clean and dry when used.

1.3 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contaminations.

1.4 The samples shall be placed in suitable, clean dry and air-tight glass containers on which the material has no action.

1.5 The sample containers shall be of such a size that they are almost completely filled by the sample.

1.6 Each sample container shall be sealed air-tight after filling and marked with full details of sampling, the date of sampling and the year of manufacture of the material.

1.7 Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the normal temperature.

2. Method of Sampling**2.1 Sampling from Bulk in Heaps, Shiploads or Wagons.**

2.1.1 Several samples shall be taken from each unit "load" by means of a scoop of about 1 lb. (or 0.5 kg) capacity from different parts, e.g. the front, middle and back and at different depths at regular intervals as the material is being unloaded.

2.1.2 *Procedure*—Place the separate samples, as collected above, in a covered cask. After the sampling is finished, empty out the contents of the cask on a level, clean and hard surface, spread them out flat and scoop the mass together into a cone in the centre by working regularly round the heap with a spade. Flatten the heap again and take a sample by removing two diagonally opposite quadrants with the scoop. To this add some material from the middle of each of the remaining quadrants. Repeat this operation until finally not more than 4 lb (or 2 kg) are left. Mix thoroughly and divide among the sample bottles required for analysis.

2.2 Sampling from Packages

2.2.1 A number of packages not less than the cube root of the total number of packages in the lot shall be selected at random. For convenience

the following table is given showing the number of samples to be selected for sampling from various sizes of lots:

Minimum number of Packages to be Selected for sampling from various Sizes of Lots.

Lot Size	Sample Size
2 to 8	2
9 " 27	3
28 " 64	4
65 " 125	5
126 " 216	6
217 " 343	7
344 " 512	8
513 " 729	9
730 " 1000	10
1001 " 1331	11

2.2.2 Where a consignment is declared to consist of different batches of manufacture and the batches are marked separately, the packages may be separated according to batches and each batch may be treated as a separate lot. The purchaser may examine each sample from each lot separately or he may prepare a composite sample from the individual samples of a lot, at any stage of analysis, to obtain a reduced sample for further analysis.

2.2.3 *Sampling Instruments*—For drawing the samples from packages containing the material in a loose condition such as sacks, an auger shall be used.

2.2.4 *Procedure*—Introduce the auger into different parts of each package to draw samples, the quantity of sample drawn from each part of the package being not less than 0.5 lb. (or 225 g) and the total weight of the composite sample being not more than 10 lb (or 4.5 kg).

2.3 Prepare three sets of test samples of not less than 1 lb (or 450 g)-each from the composite sample by coning and quartering, and transfer to clean and dry glass bottles. The test samples shall be marked with the lot number of the consignment sampled, date of sampling, year of manufacture and other particulars.

2.4 One set of the test samples shall be sent to the purchaser and one set to the vendor. The third set of the test samples, bearing the seals of the purchaser and the vendor, shall constitute the referee sample in case of dispute between the purchaser and the vendor.

APPENDIX B

(Clause 3.2)

*Determination of Moisture Content.***1 Procedure**

1.1 Accurately weigh a dry Erlenmeyer flask about 14 to 15 cm high and of about 250 ml capacity together with a dry funnel inserted into the neck. Transfer into the flask about 20 g of salt and spread it so as to form a thin layer at the bottom. Replace the funnel and again weigh the flask and funnel accurately. Remove the funnel and heat the flask in an air oven at 140° to 150° C for 4 hours, when there should be no water drops on the sides of the flask. Replace the funnel. Cool in a desiccator, and weigh.

2. Calculation

2.1 From the loss in weight, calculate the moisture content as the percentage of the weight of the undried material taken for the test.

APPENDIX C

(Clause 3.3)

*Analysis of Edible Common Salt***1. Method**

1.1 Examine qualitatively a solution of the material for the common radicals present and estimate quantitatively all of them, excepting sodium, depending upon the nature of radicals present. Calculate the percentage of composition on the basis of the dried material, as described in 10 below

2. Quality of Reagents

2.1 Unless specified otherwise, chemicals of the purest grade shall be employed in tests and distilled water shall be used where the use of water as a reagent is specified.

3. Preparation of Sample

3.1 Grind about 100 g of the material and dry as prescribed under 1 of Appendix B. Use this prepared sample for analysis.

4. Matter insoluble in water

4.1 *Procedure*—Accurately weigh about 10 g of the prepared sample, and dissolve it in about 250 ml of water in a beaker. Filter the solution through a tared filter paper or tared Gooch or sintered glass crucible (G No. 4) and wash the residue free from soluble salts. Dry the filter paper or crucible along with the residue to constant weight at a temperature of 105° to 110° C.

4.2 *Calculation*—From the weight of the water insolubles obtained as the difference in the weights of filter paper or crucible, calculate the percentage of matter insoluble in water.

5 Determination of Total Chloride (as Cl)

5.1 *Reagents*—The following reagents are required:

- (a) *Dilute nitric acid*—approximately 4 N, free from chlorides, and
- (b) *Silver nitrate solution*—approximately 5 per cent.

5.2 Procedure—Dissolve about 0.5 g of the prepared sample, accurately weighed, in 100 ml of distilled water and add 20 ml of dilute nitric acid. Filter the resulting solution through a folded filter paper and wash the filter paper thoroughly, collecting the filtrate and washings in a 250 ml Erlenmeyer flask. Heat the combined filtrate and washings to 50°C and add to the hot solution sufficient volume of silver nitrate solution to ensure complete precipitation of chlorides. Heat to boiling to coagulate the precipitated silver chloride. Protect the silver chloride precipitate from light by wrapping around the container black paper. Filter through a tared Gooch crucible or a tared sintered glass crucible (G No. 4) and wash the precipitate with cold distilled water. Dry the crucible and its contents to constant weight at about 130°C.

5.3 Calculation—Calculate total chloride by multiplying the weight of silver chloride by 0.2474.

$$\text{Total chloride, per cent} = 24.74 \frac{D}{W}$$

where D = weight of silver chloride, and

W = weight of the prepared sample taken for the test.

6. Determination of Sulphate (as SO_4)

6.1 Reagents—The following reagents are required:

- (a) *Dilute hydrochloric acid*—approximately 4 N, and
- (b) *Barium chloride solution*—approximately 10 per cent.

6.2 Procedure—Weigh accurately about 5 g of the prepared sample and dissolve in about 100 ml of distilled water. Filter to remove undissolved matter and wash the filter paper thoroughly, collecting both the filtrate and washings in a 250 ml Erlenmeyer flask. To the filtrate and washings add 10 ml of hydrochloric acid and boil. Add to the boiling solution a slight excess of hot barium chloride solution and continue boiling for 2 minutes to obtain a granular precipitate of barium sulphate. Let it stand for four hours and filter the solution through a tared sintered glass crucible (G. No. 4) or a tared Gooch crucible. Wash the precipitate till it is free from chlorides, and dry to constant weight at 105° to 110°C.

6.2.1 Excess of barium chloride is necessary to reduce the solubility of barium sulphate. Precipitation, in hot solution by addition of barium chloride in a slow stream with stirring minimizes mechanical occlusion of barium chloride and gives a coarse precipitate, which is less soluble in acids.

6.3 Calculation—From the difference in the weights of the crucible calculate the weight of sulphate by multiplying with the factor 0.4115. Express the weight as the percentage of sulphate present in the material taken for the test.

7. Determination of Calcium

7.1 Reagents—The following reagents are required:

- (a) *Ammonium chloride*—solid,
- (b) *Dilute ammonium hydroxide solution*—approximately 2 N,
- (c) *Ammonium oxalate solution*—saturated,
- (d) *Dilute sulphuric acid*—1:4, by volume,
- (e) *Standard potassium permanganate solution*—approximately 0.1 N, and
- (f) *Ammoniacal water*—approximately 0.15 N solution of ammonium hydroxide.

7.2 Procedure—Weigh accurately about 10 g of the prepared sample and dissolve it in water. Filter and wash the insoluble residue thoroughly. Make up the filtrate and washings to 500 ml and transfer exactly 100 ml of this solution into a 500 ml beaker. Dilute to 250 ml, add 5 to 10 g of ammonium chloride, and boil. Make the boiling solution ammoniacal and add, with stirring, an excess of hot saturated ammonium oxalate solution. Continue boiling till the precipitate becomes granular. Let it stand for one hour, filter and wash with ammoniacal water. Preserve the filtrate and washings for estimating magnesium, if present, as under 8. Pierce the apex of the filter paper with a stirring rod and wash the precipitate and the rod into a beaker with hot water. Then wash the filter paper a few times with warm dilute sulphuric acid. Add about 30 ml of dilute sulphuric acid to the washings, dilute to about 250 ml, heat to 60°C and titrate while hot with standard potassium permanganate solution.

7.2.1 The solution should have enough ammonium chloride to prevent precipitation of magnesium hydroxide when it is made alkaline with ammonia. When only a little magnesium is present, neutralization of excess of hydrochloric acid by ammonium hydroxide may form enough ammonium chloride but in presence of appreciable quantities of magnesium it is better to add 5 to 10 g of ammonium chloride.

7.2.2 To test the adequacy of the washing of the precipitate, add a drop of potassium permanganate to hot dilute sulphuric acid to give faint pink colour. Allow a drop of the washings to fall into this solution. If the permanganate solution is decolorized, the washing must be continued.

7.3. Calculation—Calculate the quantity of calcium present on the basis that 1 ml of 0.1 N KMnO_4 solution is equivalent to 0.002004 g of calcium and express the result as the percentage of calcium in the material taken for the test.

8. Determination of Magnesium

8.1 Reagents—The following reagents are required:

- (a) *Dilute hydrochloric acid*—approximately 4 N,
- (b) *Microcosmic salt solution*—10 per cent,
- (c) *Ammonium hydroxide solution*—sp-gr 0.88, and
- (d) *Dilute ammonium hydroxide solution*—approximately 1 N.

8.2 Procedure—Add to the filtrate and washings from 7.2 sufficient dilute hydrochloric acid to make the solution faintly acidic and then add microcosmic salt solution in excess. Stir the contents of the beaker vigorously and then add, in small portions, 50 ml of ammonium hydroxide solution. Stir the solution well without scratching the sides of the beaker. Set the beaker aside overnight. Filter through a tared Gooch crucible and wash the precipitate with dilute ammonium hydroxide solution. Dry the precipitate at $100^\circ \pm 2^\circ\text{C}$. Heat the crucible at first over a low flame and then slowly increase the flame and finish by heating at about 1100°C till the precipitate is white, indicating that the salt has been converted to magnesium pyrophosphate. Cool in a desiccator and weigh to determine the weight of magnesium pyrophosphate.

8.3 Calculation—Calculate the magnesium by multiplying the weight of the pyrophosphate with the factor 0.2184 and find the weight of magnesium present in the total weight of the material taken for the test. Express the result as the percentage of magnesium in the material.

Determination of Soluble Carbonates

9.1 Method—If soluble carbonates are present, estimate them volumetrically in the original undried substance and calculate the percentage result on the basis of the moisture-free material.

9.2 Reagents—The following reagents are required :

(a) *Standard sulphuric acid solution*—approximately 0.1 N, and,

(b) *Methyl orange indicator*—Dissolve 0.1 g of methyl orange in 100 ml of water.

9.3 Procedure—Accurately weigh about 10g of the undried material and dissolve it in 50 ml of freshly boiled and cooled distilled water. Filter the solution through folded filter paper, wash the filter paper thoroughly and collect the filtrate and washings in a 200 Erlenmeyer flask. Titrate the collected solution against standard sulphuric acid using methyl orange as indicator.

9.4 Calculation—Calculate in terms of carbonate radical (CO_3) the soluble carbonates present as percentage of moisture-free equivalent of the weight of the undried material taken for the test, on the basis that ml of 0.1 N sulphuric acid is equivalent to 0.003 g of carbonate (CO_3).

10. Calculation of Result

10.1 If soluble carbonates are present in the salt, calculate and express as percentage of calcium carbonate. If there is excess of the carbonate over what is required for calcium, combine the balance with magnesium and express as percentage of magnesium carbonate. If there is still a balance left, calculate it as sodium carbonate and express it as a percentage. Carry out the rest of the calculation as described under 10.2, 10.3 and 10.4.

10.2 After disposing of the carbonate radical or where only calcium, magnesium, chloride and sulphate radicals are present, combine all the calcium with the sulphate radical and express the result as percentage of calcium sulphate. If there is excess of the sulphate over what is required for calcium combine the excess with magnesium and express the result as percentage of magnesium sulphate. If, even after the whole of the magnesium is accounted for a sulphate, there remains some sulphate not accounted for, combine the balance of the sulphate with sodium and express the result as percentage of sodium sulphate. In such a case assume that calcium and magnesium chlorides are absent and calculate the whole of chlorine as sodium chloride, and express it as percentage.

10.3 If, after all the calcium has been accounted for as sulphate, the balance of the sulphate radical is not sufficient to fix the magnesium, combine it with a part of the magnesium and express as percentage of magnesium sulphate. Calculate the balance of magnesium as magnesium chloride and deduct the chlorine corresponding to it from the chlorine content. Calculate the residual chlorine as sodium chloride.

10.4 If, after all the sulphate is accounted for as calcium, there is any surplus of calcium, calculate it as calcium chloride and express it as percentage. Express the magnesium also as percentage of magnesium chloride. Deduct the chlorine corresponding to these chlorides from the total chlorine found experimentally, and calculate the residual chlorine as percentage sodium chloride.

11. Expression of Result

11.1 With a view to secure uniformity in the expression of results of analysis, the following pro forma table is recommended:

PRO FORMA FOR EXPRESSION OF RESULTS

Analysis of Edible Common Salt

Serial Number	Component	Per cent. by Weight (on dry basis)
(i)	Sodium chloride	
(ii)	Calcium carbonate	
(iii)	Magnesium carbonate	
(iv)	Sodium carbonate	
(v)	Calcium sulphate	
(vi)	Magnesium sulphate	
(vii)	Sodium sulphate	
(viii)	Magnesium chloride	
(ix)	Calcium chloride	

APPENDIX No. IV

TABLES

TABLE I.—*Conversion of weights and measures.*

One Imperial Gallon	= 277.274 cubic inches. = 0.1604 cubic foot. = 10 lbs. of pure distilled water at 62°F. = 4.5459631 litres. = 1.8 bushel. = 70,000 grains.
One cubic foot of water	= 1728 cubic inches. = 6.2355 gallons. = 62.35 lbs. at 62° F. = 28.32 litres.
One pound of water	= 27.73 cubic inches.
One hundredweight of water	= 1.796 cubic feet. = 11.2 gallons.
One ton of water	= 35.93 cubic feet. = 224 gallons.
One litre of water	= 0.21998 gallon. = 61.027 cubic inches.
One ounce of water	= 1.773 cubic inches. = 2.1998 lbs.
One metre	= 3.2808 feet.
One cubic metre	= 35.3148 cubic feet.
One mile	= 5,280 feet.
One acre	= 4,840 square yards.
One square mile	= 640 acres.

TABLE II

Conversion of Thermometric Readings.

°C	°F	°C	°F
1	33.8	36	96.8
2	35.6	37	98.6
3	37.4	38	100.4
4	39.2	39	102.2
5	41.0	40	104.0
6	42.8	41	105.8
7	44.6	42	107.6
8	46.4	43	109.4
9	48.2	44	111.2
10	50.0	45	113.0
11	51.8	46	114.8
12	53.6	47	116.6
13	55.4	48	118.4
14	57.2	49	120.2
15	59.0	50	122.0
16	60.8	51	123.8
17	62.6	52	125.6
18	64.4	53	127.4
19	66.2	54	129.2
20	68.0	55	131.0
21	69.8	56	132.8
22	71.6	57	134.6
23	73.4	58	136.4
24	75.2	59	138.2
25	77.0	60	140.0
26	78.8	61	141.8
27	80.6	62	143.6
28	82.4	63	145.4
29	84.2	64	147.2
30	86.0	65	149.0
31	87.8	66	150.8
32	89.6	67	152.6
33	91.4	68	154.4
34	93.2	69	156.2
35	95.0	70	158.0

TABLE II—contd.

°C	°F	°C	°F
71	159.8	111	231.8
72	161.6	112	233.6
73	163.4	113	235.4
74	165.2	114	237.2
75	167.0	115	239.0
76	168.8	116	240.8
77	170.6	117	242.6
78	172.4	118	244.4
79	174.2	119	246.2
80	176.0	120	248.0
81	177.8	121	249.8
82	179.6	122	251.6
83	181.4	123	253.4
84	183.2	124	255.2
85	185.0	125	257.0
86	186.8	126	258.8
87	188.6	127	260.6
88	190.4	128	262.4
89	192.2	129	264.2
90	194.0	130	266.0
91	195.8	131	267.8
92	197.6	132	269.6
93	199.4	133	271.4
94	201.2	134	273.2
95	203.0	135	275.0
96	204.8	136	276.8
97	206.6	137	278.6
98	208.4	138	280.4
99	210.2	139	282.2
100	212.0	140	284.0
101	213.8	141	285.8
102	215.6	142	287.6
103	217.4	143	289.4
104	219.2	144	291.2
105	221.0	145	293.0
106	222.8	146	294.8
107	224.6	147	296.6
108	226.4	148	298.4
109	228.2	149	300.2
110	230.0	150	302.0

TABLE III.—*Hydrometric Table*

B.	Sp. Gr.	Tw.	Salimeter
1	1.007	1.4	3.85
1.5	1.011	2.1	5.77
2	1.014	2.8	7.69
2.5	1.018	3.6	9.62
3	1.021	4.4	11.54
3.5	1.025	5.1	13.46
4	1.029	5.8	15.38
4.5	1.033	6.6	17.30
5	1.036	7.4	19.23
5.5	1.040	8.2	21.15
6	1.043	9.0	23.08
6.5	1.047	9.7	25.00
7	1.051	10.4	26.92
7.5	1.055	11.2	28.85
8	1.059	12.0	30.77
8.5	1.063	12.7	32.69
9	1.066	13.4	34.61
9.5	1.070	14.2	36.54
10	1.074	15.0	38.46
10.5	1.078	15.8	40.38
11	1.082	16.6	42.31
11.5	1.087	17.4	44.23
12	1.091	18.2	46.15
12.5	1.095	19.1	48.08
13	1.099	20.0	50.00
13.5	1.103	20.8	51.92
14	1.107	21.6	53.84
14.5	1.112	22.4	55.77
15	1.116	23.2	57.69
15.5	1.121	24.1	59.62
16	1.125	25.0	61.54
16.5	1.130	25.9	63.46
17	1.134	26.8	65.38
17.5	1.139	27.6	67.31
18	1.143	28.4	69.23
18.5	1.148	29.4	71.15
19	1.152	30.4	73.07

TABLE III.—*contd.*

	B.	Sp. Gr.	Tw.	Salimeter
	19.5	1.157	31.4	75.00
	20	1.161	32.4	76.92
	20.5	1.166	33.3	78.85
	21	1.170	34.2	80.77
	21.5	1.175	35.1	82.69
	22	1.180	36.0	84.62
	22.5	1.185	37.0	86.54
	23	1.190	38.0	88.46
	23.5	1.195	39.0	90.38
	24	1.200	40.0	92.31
	24.5	1.205	41.0	94.23
	25	1.210	42.0	96.15
	25.5	1.215	43.0	98.08
	26	1.220	44.0	100.00
	26.5	1.225	45.1	
	27	1.230	46.2	
	27.5	1.236	47.2	
	28	1.241	48.2	
	28.5	1.246	49.3	
	29	1.251	50.4	
	29.5	1.257	51.5	
	30	1.262	52.6	
	30.5	1.268	53.7	
	31	1.274	54.8	
	31.5	1.280	55.9	
	32	1.285	57.0	
	32.5	1.291	58.2	
	33	1.296	59.4	
	33.5	1.302	60.5	
	34	1.308	61.6	
	34.5	1.314	62.8	
	35	1.320	64.0	
	35.5	1.326	65.2	
	36	1.332	66.4	
	36.5	1.339	67.7	
	37	1.345	69.0	
	37.5	1.351	70.2	
	38	1.357	71.4	
	38.5	1.364	72.7	

TABLE III—concl'd.

	B.	Sp. Gr.	Tw.	Salimeter
	39	1.370	74.0	
	39.5	1.377	75.3	
	40	1.384	76.6	
	40.5	1.391	78.0	
	41	1.397	79.4	
	41.5	1.404	80.6	
	42	1.411	82.0	

TABLE IV

Conversion of maunds into tons

Mds.	Lbs.	Tons	Cwt.	Lbs.
1	82 2/7			82 2/7
2	164 4/7		1	52 4/7
3	246 6/7		2	22 6/7
4	329 1/7		2	105 1/7
5	411 3/7		3	75 3/7
6	493 5/7		4	45 5/7
7	576		5	16
8	658 2/7		5	98 2/7
9	740 4/7		6	68 4/7
10	822 6/7		7	38 6/7
11	905 1/7		8	9 1/7
12	987 3/7		8	91 3/7
13	1,069 5/7		9	61 5/7
14	1,152		10	32
15	1,234 2/7		11	2 2/7
16	1,316 4/7		11	84 4/7
17	1,398 6/7		12	54 6/7
18	1,481 1/7		13	25 1/7
19	1,563 3/7		13	107 3/7
20	1,645 5/7		14	77 5/7

TABLE IV—contd.

Md.	Lbs.	Tons	Cwt.	Lbs.
21	1,728		15	48
22	1,810 2/7		16	18 2/7
23	1,892 4/7		16	104 4/7
24	1,974 6/7		17	70 6/7
25	2,057 1/7		18	41 1/7
26	2,139 3/7		19	17 3/7
27	2,221 5/7		19	99 5/7
27 2/9	2,240	1		
50		1	16	82 2/7
100		3	13	52 4/7
136 1/9		5		
200		7	6	105 1/7
272		10		
300		11		45 5/7
400		14	13	98 2/7
500		18	7	38 6/7
574 4/9		20		
600		22		91 3/7
710 5/9		25		
760		27	14	32
800		29	7	84 4/7
900		33	1	2 1/7
1,000		36	14	77 5/7
1,421 1/9		50		
2,842 3/9		100		
5,000		183	13	52 4/7
10,000		367	6	105 1/7
1,00,000		3,973	9	43 3/7

TABLE V

Specific gravities of solutions of sodium chloride.

Per Cent. NaCl.	Spec. grav. at 15°/15° (Gerlach)	Spec. grav. at 20° (Schiff).
1	1.00725	1.0066
2	1.01450	1.0133
3	1.02174	1.0201
4	1.02899	1.0270
5	1.03624	1.0340
6	1.04366	1.0411
7	1.05108	1.0483
8	1.05851	1.0556
9	1.06593	1.0630
10	1.07335	1.0705
11	1.08097	1.0781
12	1.08859	1.0857
13	1.09622	1.0934
14	1.10384	1.1012
15	1.11146	1.1090
16	1.11938	1.1168
17	1.12730	1.1247
18	1.13523	1.1327
19	1.14315	1.1408
20	1.15107	1.1490
21	1.15931	1.1572
22	1.16755	1.1655
23	1.17580	1.1738
24	1.18404	1.1822
25	1.19228	1.1900
26	1.20098	1.1906
26.4	1.20433	
27		1.2075

TABLE VI
Boiling Points of Solutions of Sodium Chloride

NaCl per cent,	Boiling point degrees	NaCl per cent.	Boiling point degrees
1	100.21	16	104.14
2	100.42	17	104.46
3	100.64	18	104.79
4	100.87	19	105.12
5	101.10	20	105.46
6	101.34	21	105.81
7	101.59	22	106.16
8	101.85	23	106.52
9	102.11	24	106.89
10	102.38	25	107.27
11	102.66	26	107.65
12	102.94	27	108.04
13	103.23	28	108.43
14	103.53	29	108.83
15	103.83	29.4	108.99

TABLE VII
Solubility of Sodium Chloride in Water (Lunge)

Temperature °C	Solid residue at the bottom	Parts by weight of NaCl to 100 H ₂ O
-6.1	Ice	10.00
-13.6	"	20.00
-21.2	Ice + 2H ₂ O	28.90
-22.4	Ice + NaCl	30.00
-23.6	Ice	31.20
0	NaCl	35.63
10	"	35.69
20	"	35.82
30	"	36.03
40	"	36.32
50	"	36.67
60	"	37.06
70	"	37.51
80	"	38.00
90	"	38.52
100	"	39.12
100.7	"	39.65
140	"	42.10
160	"	43.60
180	"	44.90

TABLE VIII

Volumes of Salt Solutions (Gerlach)

Per Cent. Salt	Volume	Per cent. Salt	Volume
0	1000.00	15	1111.46
1	1007.25	16	1119.38
2	1014.50	17	1127.30
3	1021.74	18	1135.23
4	1028.99	19	1143.15
5	1036.24	20	1151.07
6	1043.66	21	1159.31
7	1051.08	22	1167.55
8	1058.51	23	1175.80
9	1075.93	24	1184.04
10	1073.35	25	1192.28
11	1080.97	26	1200.98
12	1088.59	26.4	1204.33
13	1096.22		
14	1103.84		

TABLE IX

Solubility of Sodium Sulphate in Water at Different Temperatures

°C	Grms. Na ₂ SO ₄ per 100 Grms.	
	Solution	Water
0	4.76	5.0
5	6.0	6.4
10	8.3	9.0
20	16.3	19.4
25	29.9	28.0
30	29.0	40.8
40	32.8	48.8
50	31.8	46.7
60	31.2	45.3
80	30.4	43.7
100	29.8	42.5
120	29.5	41.95
140	29.6	42.0

TABLE IX—*contd.**Solubility of Sodium Sulphate at Various Temperatures*

°C	Sodium Sulphate $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$	
	Weight in 100 parts water	Weight of water to dissolve 1 part salt
0	12.16	8.224
10	23.04	4.340
15	(18°)	
20	48.41	2.065
25	98.48	1.015
30	184.1	0.543

TABLE X

Vapour Pressure of Saturated Salt Solutions

°C	mm.	°C	mm.	°C	mm.
10	7.34	17	11.52	24	17.74
11	7.93	18	12.30	25	18.84
12	8.38	19	13.10	26	19.99
13	8.95	20	13.93	27	21.21
14	9.55	21	14.80	28	22.48
15	10.18	22	15.73	29	23.83
16	10.86	23	16.70	30	25.25

APPENDIX No. V

Analysis of Salt Produced in different Countries of the world

ENGLISH SALTS

[illegible]

AUSTRALIAN

SOUTH AFRICAN					
Composition	No. 1 Coarse	No. 2 Coarse Salt	No. 3 Coarse Salt	Granulated Salt	Fine salt
Sodium chloride	97.30	95.87	96.49	98.64	98.27
Calcium sulphate	.23	.33	.75	.23	.33
Sodium sulphate	1.73	2.73	1.52	.77	1.14
Magnesium chloride	.54	.82	.19	.25	.15
Potassium chloride	.14	.14	.10	.08	trace
Sodium carbonate	nil	nil	nil	nil	nil
Sodium bicarbonate	.01	.01	.01	.01	.01
Insoluble matter	.05	.10	.94	.02	.10
	100.00	100.00	100.00	100.00	100.00

Composition	CEYLON SOLAR SALT				ADEN		CANADIAN			
	Elephant Pass (Go- verment)	Hambantota (Native)	Puttalam (Native)	Trincomalee (Native)	Kurkutch Salt	Fine Salt	Coarse Salt	Factory filled Salt	Fine Salt	Dairy Salt
Sodium chloride	98.30	98.07	96.73	98.03	97.06	97.76	98.90	99.16	99.41	99.32
Calcium sulphate	.35	.27	.56	.38	.87	.95	1.00	.65	.49	.63
Calcium chloride	nil	nil	nil	nil	nil	nil	.07	.18	.08	.04
Sodium sulphate	.34	.42	.50	.45	.69	.42	nil	nil	nil	nil
Magnesium chloride	.67	.87	.95	.72	1.14	.72	nil	nil	nil	nil
Potassium chloride	.12	.09	.13	.09	.15	.09	nil	nil	nil	nil
Sodium chloride	trace	trace	nil	trace	.02	.03	.01	trace	trace	trace
Sodium carbonate	.02	.02	.01	.01	.02	nil	.02	.01	.02	.01
Sodium bicarbonate	.20	.26	1.12	.32	.05	.63	nil	nil	nil	nil
Insoluble matter							100.00	100.00	100.00	100.00

Composition	AMERICAN					BRAZILIAN		SPANISH		DUTCH				
	Vacuum Undried Salt.	Vacuum Pan Salt.	Grainer Undried Salt.	Grainer Dried Salt.	New York State Mined Salt	Louisia-Syracus na Mined Solar Salt.	Macau Salt.	Cabo Frio Salt.	Viza Salt.	San Paula Salt.	Torre- viveja Salt.	Heavy Rough Salt refined from German Rock.	Cheese Salt refined from German Rock.	Fine Salt refined from Dutch Rock.
Sodium chloride	99.33	99.46	99.24	98.93	98.10	99.00	96.17	98.71	98.09	94.82	94.29	99.26	98.44	98.88
Calcium sulphate	.66	.51	.59	.85	.99	.60	1.12	.51	.50	1.43	.66	.22	.60	.80
Calcium chloride	.01	.03	.17	.22	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil
Sodium sulphate	nil	nil	nil	nil	.01	1.03	.28	.28	.42	1.44	2.36	.13	.20	.27
Magnesium chloride	trace	trace	trace	trace	trace	1.43	.36	.36	.78	1.76	2.14	.33	.70	.03
Potassium chloride	trace	trace	trace	trace	trace	.10	.11	.11	.02	.36	.49	trace	.04	.01
Sodium carbonate	nil	nil	nil	nil	nil	trace	trace	trace	.03	nil	nil	nil	nil	nil
Sodium bicarbonate	trace	trace	trace	trace	.01	.02	.01	.01	.01	.01	.01	.01	nil	trace
Insoluble matter	trace	trace	trace	trace	.89	.40	.13	.02	.15	.18	.05	.05	.02	.01
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

GERMAN ROCK SALT

[illegible]

APPENDIX No. VI
Table showing contraction in Volume by evaporation of Brines to different densities

B	3.9	10	15	16	17	18	19	20	21	22	23	24	25	29.5	32	33	34	35	36	38.5	36* 38.3
9	100																				
6	62.29																				
10	36.72	100																			
11	33.11	90.39																			
12	29.50	80.33																			
13	26.72	72.76																			
14	24.91	67.84																			
15	23.11	62.94	100																		
16	21.31	58.03	92.06	100																	
17	19.83	54.01	83.82	93.07	100																
18	18.32	50.44	80.16	86.92	93.40	100															
19	17.37	47.30	75.15	81.49	87.56	93.76	100														
20	16.39	44.65	70.92	76.91	82.64	88.49	94.39	100													
21	15.24	41.59	65.94	71.50	76.78	82.26	87.74	92.96	100												
22	14.26	38.84	61.67	66.91	71.90	77.00	82.12	87.00	93.58	100											
23	13.44	36.60	58.16	63.02	67.76	72.55	77.41	82.00	88.20	94.26	100										
24	12.78	34.81	55.31	59.98	64.45	69.01	73.60	77.98	83.90	89.64	95.10	100									
25	12.13	33.03	52.48	58.24	61.15	65.48	69.84	73.98	79.60	85.06	90.24	94.86	100								
29.5	1.901	5.177	8.224	8.921	9.58	10.27	10.95	11.60	12.47	13.33	14.15	14.87	15.68	100							
32	1.426	3.884	6.170	6.691	7.19	7.69	8.21	8.70	9.36	10.00	10.61	11.15	11.76	75.00	100						
33	1.327	3.614	5.746	6.232	6.69	7.17	7.65	8.10	8.72	9.31	9.88	10.39	10.95	69.85	93.13	100					
34	1.206	3.284	5.218	5.658	6.08	6.51	6.94	7.36	7.91	8.46	8.97	9.43	9.94	63.43	84.57	90.80	100				
35	1.088	2.963	4.709	5.106	5.56	5.88	6.27	6.64	7.14	7.63	8.09	8.51	8.97	57.24	76.32	81.94	90.24	100			
36	0.970	2.642	4.198	4.552	4.89	5.24	5.59	5.92	6.37	6.80	7.22	7.59	7.99	51.02	68.03	73.05	80.44	89.15	100		
38.5	0.819	2.230	3.593	3.843	4.13	4.42	4.72	4.99	5.37	5.74	6.09	6.40	6.75	43.08	57.44	61.67	67.92	75.26	84.43	100	
.63*	0.393	1.070	1.681	1.844	1.98	2.12	2.26	2.39	2.58	2.76	2.92	3.07	3.24	20.67	27.55	29.59	32.59	36.12	40.52	47.38	100
38.3	0.082	0.223	0.331	0.385	0.41	0.44	0.47	0.50	0.54	0.58	0.61	0.64	0.67	4.31	5.75	6.17	6.80	70.50	8.45	10.00	20.86

* Drop in density on Separation of Solids.

APPENDIX No. VII

Local terms explained in English

Agar	Salt pan.
Agaria	Owner of the salt pan.
Baragra	Salt of big granules.
Bapidar	Pan owners (Term used in Didwana).
Sicca	Currency precribed by Government.
Dhenkwa	A sort of lever-like mechanism used for lifting brine from wells.
Doaba	Area situated in between two rivers (generally refers to the Jullundur and Hoshiarpur districts of Panjab which are situated between Satluj and Beas rivers).
Dalal	A community doing stitching of salt bags.
Dals	Pulses.
Dittam	Govt. Reserve.
Farans	Pits for storing bitterns.
Firman	A Royal Order issued by Moghul Kings.
Haks	Right conferred for rendering services to the State.
Hakdar	Person entitled to receive Hak.
Hamals	Loaders.
Inams	Awards in the form of cash or land.
Jhilla	A group of salt heaps.
Khalaries	Salt works.
Kantva	A support given to the sides of a well to prevent their caving in.
Kos	Leather bag used to lift brine.
Khals	Rivulets.
Kharwa	Cultivator of salt pans.
Kharvi	Same as Kharwa.
Kudivaram	Payment made by Govt. to salt manufacturers under the Monopoly system in the Madras Region.
Lagga	A sort of levy.
Melavaram	Tax for land.

Paodis	Spades.
Raja	King.
Sazas	A group of salt works.
Souba	A Government official in olden days.
Sanads	Certificates establishing a title.
Sowars	Rider (Local term used in Bombay Region for Guard provided with horse and employed on preventive duties).
Shivnars	Sewers of bags.

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